OPERATING MANUAL

T-BERD 203
DS1/DS0 ANALYZER

Telecommunications
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T-BERD 203
DS1/DS0 ANALYZER
OPERATING MANUAL

APRIL 1990

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GENERAL INFORMATION

1.1 INTRODUCTION

This manual provides information on the physical and functional features, operation, and specifications of the Telecommunications Techniques Corporation T-BERD 203 DS1/DS0 Analyzer option. The T-BERD 203 attaches to the T-BERD 305 DS3 Analyzer which provides test and analysis capabilities for a DS1 drop. This section describes the T-BERD 203 feature, capabilities, and options. The T-BERD 305 must have software revision level I or higher installed to operate with the T-BERD 203.

1.2 FEATURES AND CAPABILITIES

The T-BERD 203 is designed to test and analyze T-Carrier transmission systems at the DS1 and DS0 levels from DS3 access points (using the T-BERD 305) or directly from DS1 access points during routine maintenance, installation, acceptance testing, and fault isolation. The T-BERD 203 provides the following features and capabilities.

(1) **Analyze a DS1 channel** dropped from a DS3 access point when connected to the T-BERD 305 through the T-BERD 305 DS1 Drop Option for out-of-service testing and in-service monitoring.

2) **Generate DS1 test patterns** (QRSS, 3 IN 24, ALL ONES, 2^{20}-1, 2^{23}-1, and programmable) with the appropriate DS1 framing requirements for out-of-service circuit testing and analysis.

(3) **Operates in T1 unframed and framed modes.** Framed signals include: T1 D4 (superframe), T1 ESF (Extended Superframe Format), T1 ESFz (refers to ESF using ZBTSI encoding, optional), and SLC*-96 (Subscriber Loop Carrier).

(4) **Displayed test results** provide simultaneously accumulated logic, BPV, CRC, and frame error counts; error rates, errored seconds, and percent of error-free seconds calculations; pattern slips, received frequency measurement, and D4, ESF, ESFz, and SLC signaling status.

*SLC is a registered trademark of AT&T Technologies.

(5) **Monitors for signal, pattern, and frame losses** and reports them as current and historical alarm events on the front panel. Current event alarms provide a real-time indication of the monitored event, and historical event alarms indicate the event occurred at some time during the test.

(6) **Monitors for excess zeros, yellow alarms, and all ones** conditions and reports them as current and historical alarm events on the front panel.

(7) **Monitors for T1 pulses, pattern and frame synchronization,** and reports them as successful events on the front panel.

(8) **Logic error insertion** can be done as a single logic error or continuously at a rate of 10^{-3} to stress error detect circuits or verify signal continuity between the transmitted and received signals.

(9) **Sliding digital volume unit (VU) type signal level meter** indicates the average signal level of the selected voice frequency (VF) channel. The meter has a range from -54 dBm to +3 dBm. A signal clipping LED indicates when the VF signal exceeds +3 dBm.

(10) **Transmit timing control** is provided through a front panel switch for internal (crystal controlled) or recovered (loop) clock source.

(11) **T1 DSX-level output** allows the T-BERD 203 to be connected to a DS1 access point and transmit DS1 formatted test patterns.

(12) **T1 DSX-level input** accepts the DS1 signal from the T-BERD 305 DS1 Drop Option or DS1 DSX access point.

(13) **Selects individual DS0 channels** allowing data bits and D4, ESF, ESFz, and SLC signaling bits (A, B, C, and D) to be monitored.

(14) **A Speaker and VF output jack (with fixed output)** provide audible VF outputs for the selected DS0 channel.

(15) **RS-232 printer/remote control interface** provides a connection for a serial printer or asynchronous remote control operation from a computer or dumb terminal.

(16) **Three fixed and 3- to 8-bit programmable loop-up and loop-down codes** provide remote loopback capabilities from a single

site. The programmable loop code function allows the T-BERD 203 the versatility to control loopback capabilities of a variety of CSUs and facility loopback units.

(17) **An RS-232-C data port interface** provides access to the selected DS0 data channel and the ESF, ESFz, and SLC data links.

(18) **Operates with AMI (Alternate Mark Inversion), B8ZS (Bipolar with 8 Zero Substitution), and ZBTSI (Zero Byte Time Slot Interchange) encoded data.** If a circuit is using B8ZS, the T-BERD 203 automatically detects B8ZS encoding and indicates it on the front panel. ZBTSI operation requires the T-BERD 203 ZBTSI Option.

(19) **Continuous tests** can be established directly from the T-BERD 203. A restart switch allows tests to be restarted at any time.

(20) **A display hold function** allows the test results to be frozen while a test is in progress to check all test results without interrupting the accumulation of the results.

1.3 OPTIONS AND ACCESSORIES

The following options and accessories are available for the T-BERD 203.

(1) ZBTSI Option (203-1) allows the T-BERD 203 to operate and test circuits using ZBTSI encoding.

(2) T-BERD 305 Remote Control Option (305-4) must be installed to operate a printer or remote control device from the T-BERD 203.

(3) T-BERD 305 DS1 Drop Option (305-1) is needed in order to drop a DS1 signal from the T-BERD 305 and pass it to the T-BERD 203.

(4) The following rack mounts are available for the T-BERD 203:

19" Rack Mount	11221-01
23" Rack Mount	11222-01

INSTRUMENT DESCRIPTION

2.1 INTRODUCTION

This section describes the T-BERD 203 DS1/DS0 Analyzer operating modes and T-Carrier measurement capabilities. Descriptions of the T-BERD 203 front panel switches, indicators, displays, and connectors are also included.

2.2 PHYSICAL DESCRIPTION

The T-BERD 203 is packaged in a case that replaces the standard T-BERD 305 cover. An extension cable is used to connect the T-BERD 203 to the T-BERD 305 for power and communications between them. One RS-232-C connector provides a connection for either a printer or remote control device. Another connection provides access to the selected DS0 data channel or ESF or SLC data link which can be analyzed by a protocol analyzer. The T-BERD 305/203 can generate test result printouts at any time during a test and generate printouts to record the front panel configuration of a test set-up.

2.3 OPERATING MODES

The T-BERD 203 operates in five modes:

(1) T1 - Unframed for testing clear channel DS1.

(2) T1 D4 - T1 superframe.

(3) T1 ESF - T1 extended superframe.

(4) T1 ESFz - T1 extended superframe with Zero Byte Time Slot Interchange (ZBTSI) compatibility. This mode only appears when the T-BERD 203 ZBTSI option is installed.

(5) T1 SLC - T1 Subscriber Loop Carrier framed data.

2.3.1 Test Modes

The T-BERD 203 can be configured to receive live data for in-service monitoring and analysis or it can be configured for a selected test pattern for out-of-service testing. In out-of-service testing, end-to-end and loopback tests can be performed. The T-BERD 203 can generate DS1 loop codes to loop up or loop down a device with loopback capabilities.

The T-BERD 203 received signal can come from the T-BERD 305 DS1 Drop Option where the DS3 signal is demultiplexed to the DS1 level or directly from a DS1 access point where the T-BERD 203 can demultiplex the DS1 signal down to the individual DS0 channels.

The T-BERD 203 generates and receives DS1 test patterns used in out-of-service DS1 circuit analysis. When the T-BERD 203 is connected to the T-BERD 305 DS1 Drop Output, in-service DS1 and DS3 error measurements, performance measurements, and signal analysis can be performed simultaneously from any DS3 access point. DS1 and DS3 results can be correlated between the T-BERD 203 and the T-BERD 305.

Error measurements include logic, BPV, CRC, and frame errors and associated error rate, errored second, and percent error-free second calculations. Signal loss and alarm conditions are continuously displayed with both current and historical indications provided. An RS-232 printer/remote control interface allows all test results to be sent to a standard RS-232 printer or remote control device.

2.3.2 B8ZS Encoding

The T-BERD 203 automatically detects B8ZS encoding in the received signal. The T-BERD 203 can also transmit test patterns with B8ZS encoding. The T-BERD 203 must be configured manually to transmit B8ZS encoded data by setting the T-BERD 305 DS1 LINE CODE DIP switch (SW 14). When B8ZS is detected, the T-BERD 203 B8ZS LED illuminates.

2.4 CONTROLS, INDICATORS, AND CONNECTORS

The T-BERD 203 is operated through a variety of switches on the front panel as shown in Figure 2-1. A liquid crystal display (LCD) and a number of LEDs provide visual indications of the T-BERD 203 operation and

performance during testing. The following paragraphs describe the functions of the LCD, switches, and LEDs. The bracketed numbers [x] correspond to the numbers in Figure 2-1.

2.4.1 Liquid Crystal Display

The LCD [3] is a two line, 46-character, display which is divided into three sections. The first section, MODE/PATTERN display, is used to display the operating mode and test pattern being used by the T-BERD 203. The second and third sections, RESULTS I and RESULTS II displays, are used to display test results selected by the RESULTS I and RESULTS II switches [4]. The two displays also indicate a variety of functional capabilities of both RESULTS switches when Auxiliary functions are selected with the MODE switch [1].

2.4.2 Controls and Indicators

The T-BERD 203 front panel controls and indicators include a number of rocker switches, momentary pushbutton switches with or without illumination, and status LEDs. The following paragraphs describe each of the controls and indicators of the T-BERD 203.

(1) **MODE Switch** [1] - - The two-position rocker switch controls the transmit and receive data operating mode format (T1 unframed, T1 D4, ESF, ESFz, and T1 SLC) and the Auxiliary functions for the T-BERD 203. The selected mode appears on the top line of the display (labeled MODE) immediately above the **MODE** switch. Press and hold either **MODE** switch arrow for more than 1 second to scroll through the available modes. Releasing the **MODE** switch for more than two seconds selects the displayed operating mode. Changing operating modes causes a test restart. To scroll from the selected operating mode to the Auxiliary functions, press and hold the **MODE** switch until AUX appears in the display. Selecting the Auxiliary functions menu does not change the operating mode. The available operating format modes include:

(a) **T1 unframed** - - The T1 unframed operating mode configures the T-BERD 203 to transmit and receive unframed T1 data.

(b) **T1 D4** - - The T1 D4 operating mode configures the T-BERD 203 to test and analyze D4 framed T1 circuits. T1 D4 mode is the power-up default.

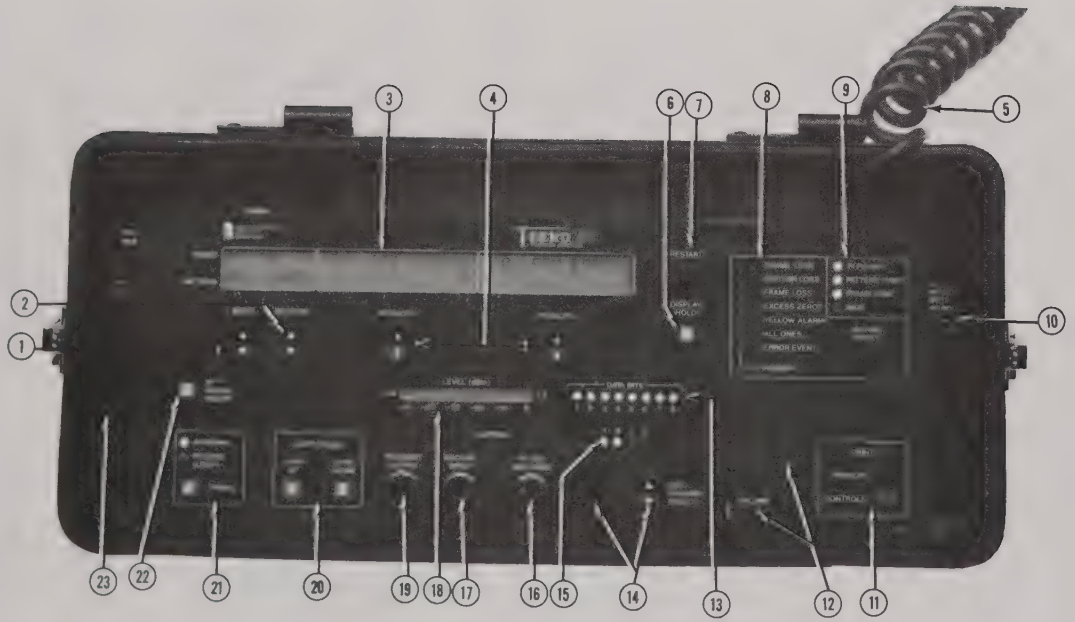

Figure 2-1
T-BERD 203 DS1/DS0 Analyzer

(c) **T1 ESF** - - The T1 ESF operating mode allows the T-BERD 203 to test and analyze Extended Super Frame (ESF) T1 circuits.

(d) **T1 ESFz** - - The T1 ESFz operating mode allows the T-BERD 203 to test and analyze T1 ESF circuits using Zero Byte Time Slot Interchange (ZBTSI) encoding. This mode only appears when the ZBTSI option is installed.

(e) **T1 SLC** - - The T1 SLC operating mode is used to monitor T1 lines which use the SLC-96 data format.

(f) **AUX** - - The Auxiliary function mode allows operating parameters to be set for functions not provided with switches. When the AUX mode is selected, the bottom line of the display (labeled PATTERN) shows the Auxiliary function. Press the **PATTERN** switch to scroll through the available Auxiliary functions. Once the desired Auxiliary function is displayed, the function parameters are modified by pressing either the Up or Down arrow on the **RESULTS I** or **RESULTS II** switch to select the desired function parameter. The MODE display line above each **RESULTS** switch indicates the function parameter and the arrow to press in a specific Auxiliary function. The Auxiliary functions are described in Section 2.5.

(2) **PATTERN Switch** [2] - - The two-position rocker switch selects the test pattern to be transmitted and informs the receiver which test pattern to expect. The patterns appear on the bottom line of the display (labeled PATTERN) immediately above the switch. Press either **PATTERN** switch arrow for more than 1 second to scroll through the available patterns. Release the **PATTERN** switch to select the displayed pattern. The **PATTERN** switch is also used to scroll through the Auxiliary functions when selected with the **MODE** switch (see Section 2.4.2). Changing patterns causes a test restart. The six data patterns include:

(a) **QRSS** - - The Quasi-Random Signal Source pattern generates a modified 2^{20}-1 pattern with 14-zero suppression.

(b) **2^20-1** - - The 2^{20}-1 pattern generates a 1,048,575-bit pseudorandom pattern with a maximum of 19 sequential zeros and 20 sequential ones.

(c) **2^23-1 - -** The 2^{23}-1 pattern generates a 8,388,607-bit pseudo-random pattern with a maximum of 22 sequential zeros and 23 sequential ones.

(d) **PGM PAT - -** The user-defined programmable pattern allows a 3- to 24-bit binary pattern to be defined through the Auxiliary PGM PAT function. The default pattern is 1000 0000.

(e) **ALL ONES - -** The ALL ONES pattern generates a fixed Mark only test pattern.

(f) **3 IN 24 - -** The 3 IN 24 pattern generates a fixed pattern of 3 Marks separated by 3 Spaces and 15 consecutive Spaces in every 24 bits.

NOTE: Pressing either the **LOOP UP** or the **LOOP DOWN** switch overrides the selected test pattern. A message (PGM LPUP or PGM LPDN) is displayed in place of the pattern name while the loop code is sent. When the loop code transmission is terminated, the selected pattern is restored, and its name reappears in the display.

(3) **RESULTS I and RESULTS II Switches** [4] - - The two-position rocker switches control the test results displayed above them. Press either **RESULTS** switch arrow for more than 1 second to scroll through the available results. Release the **RESULTS** switch to select the displayed result. The switches are also used to configure the Auxiliary functions selected through the **MODE** switch (see Section 2.4.2). Changing results does not cause a test restart, however changing Auxiliary functions does cause a test restart. Refer to Measurements (see Section 2.6) for a description of the available results.

(4) **DISPLAY HOLD Switch** [6] - - When the momentary pushbutton switch is pressed, all of the results (displayed or otherwise) and alarm and status LEDs are frozen at their current states. This allows the results and alarm and status LEDs to be viewed at any given moment. When DISPLAY HOLD is enabled (red LED inside switch illuminates), the T-BERD 203 continues to accumulate test results but does not update the displayed results at that moment. Use the **RESULTS** switches to scroll through the test results. When the switch is pressed again while the LED is illuminated, DISPLAY HOLD is deactivated, the switch LED goes off, and all the results and alarm and status LEDs are updated.

It should be noted that pressing any major switches (e.g., RESTART or MODE) during the display hold restarts the accumulating results not the frozen results.

(5) **RESTART Switch** [7] - - When pressed, the momentary pushbutton switch clears all results and HISTORY LEDs and restarts the test, timed or continuous.

(6) **Alarm Status Panel** [8] - - The panel provides a visual indication that a specific condition or failure is detected or occurred during the course of a test. When one of the seven alarm conditions occur, the Current Alarm LEDs (right column) illuminate for at least 100 ms. After the Current Alarm condition is cleared, the associated HISTORY LED illuminates providing a visual record of an alarm condition that occurred at some time during the test. The HISTORY LEDs remain illuminated until the **HISTORY RESET** or **RESTART** switch is pressed. Note that the **HISTORY RESET** switch does not restart tests, does not affect any of the current alarm LEDs, or accumulated test results. The **HISTORY RESET** switch is not operable when DISPLAY HOLD (switch illuminated) is activated. The following describes the function of the alarm LEDs:

(a) **SIGNAL LOSS** - - The LED illuminates when no T1 pulses are detected for 150 ms or more.

(b) **PATTERN LOSS** - - After pattern synchronization is acquired, the LED illuminates when a loss of pattern synchronization has occurred with the QRSS, 2^{20}-1, 2^{23}-1, or ALL ONES test pattern being received. Pattern synchronization is lost when 250 bit errors are counted in 1,000 or less data bits. When transmitting the PGM PAT or 3 IN 24 pattern, the LED illuminates when 100 bit errors are counted in 1,000 or less data bits. When pattern synchronization is reacquired, the Current Alarm LED goes off and the HISTORY LED illuminates.

(c) **FRAME LOSS** - - The LED illuminates when two out of five D4 or SLC-96 F_t (Terminal Frame) bits are in error, or when two out of five ESF FAS (Frame Alignment Signal) bits are in error.

(d) **EXCESS ZEROS** - - The LED illuminates when 16 or more consecutive zeros are detected.

(e) **YELLOW ALARM - -** The LED illuminates when Bit 2 of each channel has been forced to a zero in D4 or SLC-96 framed signals, or when the yellow alarm pattern (0000 0000 1111 1111) is detected in the ESF or ESFz data link. This alarm condition only applies to framed T1 signals.

(f) **ALL ONES - -** The LED illuminates when 2,048 consecutive ones are detected.

(g) **ERROR EVENT - -** The ERROR EVENT Alarm Current and HISTORY LEDs are provided to indicate that a CRC error, logic error, BPV, or frame error has occurred during the test. Use the **RESULTS** switches to check the test results for errors.

(7) **Received Signal Status** [9] **- -** The green LEDs illuminate for at least 100 ms when the indicated signal condition is satisfied. The following describes the function of the status LEDs:

(a) **T1 PULSES - -** The LED illuminates when a T1 signal is received. If T1 pulses are not detected, the T1 PULSES LED goes off and the SIGNAL LOSS LED illuminates.

(b) **PATTERN SYNC - -** The LED illuminates when pattern synchronization is achieved. Synchronization to a fixed pattern (PGM PAT, ALL ONES, and 3 IN 24) is declared when 30 consecutive error-free bits are received. For pseudo-random patterns, synchronization is declared when 30 + n consecutive error-free bits for a pattern length of 2^n-1 (for the QRSS pattern, n = 20) are received. If pattern synchronization is lost, the PATTERN SYNC LED goes off and the PATTERN LOSS LED illuminates. Pattern synchronization is disabled during loop-code transmissions.

(c) **FRAME SYNC - -** The LED illuminates when frame synchronization is achieved with the selected framing pattern. If frame synchronization is lost, the FRAME SYNC LED goes off and the FRAME LOSS LED illuminates. The framing pattern is selected through the **MODE** switch (T1 D4, T1 ESF, T1 ESFz, and T1 SLC).

(d) **B8ZS - -** The LED illuminates when B8ZS encoded data is detected. The T-BERD 203 recognizes the B8ZS BPVs and reconfigures the BPV results to ignore them.

(8) **PRINT Switch** [11] - - The two-position rocker switch generates either a RESULTS or CONTROLS printout when the indicated position is pressed. Pressing the switch on the RESULTS side generates a printout of up-to-the-minute test results. Pressing the switch on the CONTROLS side generates a printout of the current configuration of the instrument. The printouts are output through the PRINTER/REMOTE CONTROL connector. Refer to Section 5, Printer Operation, for additional information.

(9) **VOLUME Control and Speaker** [12] - - The built-in speaker generates an audio output of the VF signal of the selected DS0 channel. The **VOLUME** control slide switch located below the speaker controls the speaker output only. The VF signal is also available through the VF OUT 600 OHM jack. When frame synchronization is lost, the signal is squelched at both outputs.

(10) **DATA BITS Display** [13] - - The eight LEDs indicate the status of the data bits of the selected DS0 channel. The LEDs are updated at the 8 kHz rate where an illuminated LED equals a one and no illumination equals a zero. The DATA BITS Display is not illuminated when frame synchronization is lost.

(11) **DS0 CHANNEL SELECT Switch and Display** [14] - - The two-position rocker switch enables the selection of the DS0 channel to be monitored on the DS1 circuit. Press either **DS0 CHANNEL SELECT** switch arrow for more than 1 second to scroll through the available DS0 channels (1 - 24). Release the **DS0 CHANNEL SELECT** switch to select the displayed channel. Channel 24 is the default channel displayed at power-up. The channel number is displayed on a two-digit, seven-segment, LED display located next to the switch.

(12) **Signaling Display** [15] - - The four LEDs, labeled A, B, C, and D, indicate the ESF and ESFz (ZBTSI) signaling status of the selected DS0 channel. LEDs A and B also indicate the signaling status for the D4 and SLC framed signals. An illuminated LED equals a one and no illumination equals a zero. The Signaling Display only responds to signaling after frame synchronization is established.

(13) **LEVEL (dBm) and CLIPPING LEDs** [18] - - The LEVEL meter displays the average signal level of the selected DS0 channel in a sliding digital volume unit (VU) meter format. The LEVEL meter consists of 20 LED segments which represent a 3 dB change in amplitude per segment from -54 dBm to +3 dBm. The CLIPPING

LED illuminates when the VF signal level exceeds +3 dBm. When the CLIPPING LED blinks during normal conversation on the selected channel, the signal gain at the source may be too high. When frame synchronization is lost, the LEVEL meter is not illuminated.

(14) **LOOP CODES Switches** [20] - - The **LOOP UP** and **LOOP DOWN** momentary pushbutton switches are used to generate loop-up and loop-down codes to place CSUs or other facilities into loopback or release from loopback. When either switch is pressed, the displayed data pattern (on the PATTERN line) is replaced with a message indicating which loop code is being transmitted. When the loop-code transmission is completed, the T-BERD 203 returns to transmitting the selected data pattern, and the display reflects the selection. When a loop-code transmission is completed, a test restart occurs.

(a) **LOOP UP Switch** - - The switch controls the transmission of the loop-up code selected through the Auxiliary Loop Code Select (LP CODE) function. Four different loop-up codes can be selected from the LP CODE function (FAC1, FAC2, CSU, and PGM). Select and/or verify the appropriate loop code through the LP CODE function before pressing the **LOOP UP** switch. Once the **LOOP UP** switch is pressed, the loop-up code is continuously transmitted until either (1) the loop-up code is detected by the T-BERD 203 receiver for 250 ms, or (2) the **LOOP UP** switch is pressed again. The **LOOP UP** switch illuminates (LED inside switch) during the loop-code transmission.

(b) **LOOP DOWN Switch** - - The switch controls the transmission of the loop-down code selected through the Auxiliary Loop Code Select (LP CODE) function. Four different loop-down codes can be selected from the LP CODE function (FAC1, FAC2, CSU, and PGM). Select and/or verify the appropriate loop code through the LP CODE function before pressing the **LOOP DOWN** switch. Once the **LOOP DOWN** switch is pressed, the loop-down code is continuously transmitted until either (1) the loop-down code is no longer detected by the T-BERD 203 receiver, or (2) the **LOOP DOWN** switch is pressed again. The **LOOP DOWN** switch illuminates (LED inside switch) during the loop-code transmission.

(15) **TIMING Switch** [21] - - The momentary pushbutton switch is used to select the transmit timing source. Pressing the switch selects

either INTERNAL or RECOVD (LOOP) timing and illuminates the appropriately labeled LED. In the INTERNAL position, the transmit data is clocked out using a fixed internal crystal-controlled oscillator at the T1 rate. In the RECOVD (LOOP) position, the transmit timing source is taken from the clock source recovered from the received signal data. If no signal is received, the **TIMING** switch illuminates (LED inside switch) indicating the source is unavailable. Once the recovered clock becomes available, the **TIMING** switch LED goes off. Pressing the switch causes a test restart.

(16) **ERROR INSERT/10^{-3} Switch** [22] - - The momentary pushbutton switch causes logical bit errors to be inserted into the transmitted data pattern. Pressing the switch for less than 1 second causes a single logic error to be inserted into the data pattern. Holding the switch down for more than 1 second causes the insertion of logic errors at a 10^{-3} bit error rate, and the switch illuminates (LED inside switch). Logic errors are only inserted into the data bits, not the framing bits.

2.4.3 Connectors

The T-BERD 203 has connections which allow it to be connected to the T-BERD 305, DS1 DSX access points, and a printer or remote control device. Additional connections provide access to voice frequency and data link signals. Refer to Figure 2-1 for the location of the connectors. The connections are described as follows:

(1) **Extension Cable** [5] - - The coiled extension cable provides power to the T-BERD 203 from the T-BERD 305 and internal communications between the T-BERD 203 and T-BERD 305. The connector is RS-232-C compatible and ONLY connects to the T-BERD 305 RS-232-C INTERFACE connector. When the T-BERD 203 is not in use, the extension cable should be stored in the top tray of the T-BERD 203. Do not attempt to close the T-BERD 203 with the cable extended. When power is applied to the T-BERD 305, a communication link-up procedure occurs between both units. Status messages appear in the display indicating the progress and success or failure of the link up. Once the link is established, normal operation can continue.

WARNING: Connect the cable ONLY after power has been removed from the T-BERD 305. Installing the cable

while power is applied to the T-BERD 305 can cause damage to the T-BERD 305 and the T-BERD 203.

(2) **PRINTER/REMOTE CONTROL Connector** [10] - - The RS-232-C compatible DCE connector provides asynchronous communications between the T-BERD 305/203, and an external computer, terminal, or printer. The connector is a 25-position, D-type, female connector. Table 2-1 lists the PRINTER/REMOTE CONTROL Connector pin assignments.

Table 2-1
PRINTER/REMOTE CONTROL Connector Pin Assignments

Pin No.	Designation	Direction	Description
1	Protective Ground	- -	Connected to chassis ground.
2	Transmitted Data (TD)	IN	The T-BERD 305/203 receives data on this lead.
3	Received Data (RD)	OUT	The T-BERD 305/203 transmits data on this lead.
5	Clear to Send (CTS)	OUT	The lead goes ON when the T-BERD 305/203 is ready to receive data. The lead can be ignored by the remote device if, before sending commands, it waits for the return of the prompt character from the T-BERD 305/203 signifying the completion of the previous command. The PROMPT is enabled through the T-BERD 305 PROMPT command.
6	Data Set Ready (DSR)	OUT	Always ON when power is applied.
7	Signal Ground	- -	Connected to signal ground.
20	Data Terminal Ready (DTR)	IN	When the lead is ON (from attached device, data is transmitted on Pin 3.

The interface monitors the Data Terminal Ready (DTR) lead of the connected device. When DTR is ON, the interface assumes that the connected device is ready to receive data transmitted from the interface on the Received Data (RD) lead. The interface sets the Clear To Send (CTS) lead ON when the T-BERD 305/203 is ready to receive data on the Transmitted Data (TD) lead.

Printouts or remote control command responses are transmitted from the T-BERD 305/203 to the connected device in a serial asynchronous format with one start bit, seven data bits with even or odd parity or eight data bits with no parity, and two stop bits. Received data is accepted in the same format but the T-BERD 305/203 does not care about the number of stop bits used. The T-BERD 305/203 uses the 7-bit American Standard Code for Information Interchange (ASCII) character format.

The port is automatically configured at power-up to coincide with the T-BERD 305 DIP switch settings. The T-BERD 203 Auxiliary functions, PRINTER/REMOTE CONTROL Connector Baud Rate and Parity, allow the settings to be changed after power-up. Refer to Section 5, Printer Operation, for additional information on operating a printer from the connector or Section 6, Remote Control Operation, for controlling the T-BERD 203 from a remote device.

(3) **VF OUT 600 OHM Jack** [16] - - The WECO 310 jack provides a calibrated 0 dBm VF output across a 600-ohm termination. The output signal (not level) is the same as heard from the speaker. When frame synchronization is lost, the jack and speaker are squelched.

(4) **RECEIVE INPUT Jack** [17] - - The WECO 310 jack accepts signal levels from +6 volts base-to-peak to 60 millivolts base-to-peak across a 100-ohm termination. The input is conditioned to accept signals which are attenuated resistively such as those found at DSX-monitor points. No cable compensation is provided.

(5) **TRANSMIT OUTPUT Jack** [19] - - The WECO 310 jack provides a 3-volt base-to-peak DSX-level transmit output across a 100-ohm termination.

(6) **DATA PORT Connector** [23] - - The RS-232-C, D-type 25-position, female connector provides access to the ESF and SLC-96 4 kb/s and ZBTSI 2 kb/s data link bit streams or the selected DS0 64 kb/s data channel. The connector is configured as a receive only

synchronous DCE. Table 2-2 describes the connector pin assignments. The DATA PORT is active only when frame synchronization is achieved. The Auxiliary DATA PORT SEL function controls the DATA PORT output by selecting DS0 or DATALINK operation. Press the **RESULTS I** switch up arrow to select DATALINK when testing ESF, SLC-96, and ZBTSI formatted data. Press the **RESULTS I** switch down arrow to select DS0 to drop the DS0 data channel. The SLC-96 signal is composed of the F_s bits and data link bits. External decoding is required to separate the F_s bits from the data link bits.

Table 2-2
DATA PORT Pin Assignments

Pin No.	Designation	Description
1	Protective Ground	Connected to chassis ground.
3	Receive Data (RD)	Data is transmitted on this lead to the attached device.
6	Data Set Ready (DSR)	This lead is ON when power is applied.
7	Signal Ground	Connected to signal ground.
8	Received Line Signal Detect (RLSD)	This lead is ON when frame synchronization has occurred with the received signal (RECEIVE INPUT jack).
17	Received Clock (RC)	Recovered from the received signal.

2.5. AUXILIARY FUNCTIONS

As described in Section 2.4.2, the **MODE** switch AUX position allows operating parameters to be set where no dedicated switches are provided. These operating parameters are set through various Auxiliary functions, which are accessed through and displayed above the **PATTERN** switch. This section describes the following Auxiliary functions.

(1) PGM PAT - Programmable Bit Pattern
(2) LP CODE - Loop Code Select

(3) PGM LPUP - Programmable Loop-Up Code
(4) PGM LPDN - Programmable Loop-Down Code
(5) LP FRM - Loop-Code Framing Criteria
(6) BAUD - PRINTER/REMOTE CONTROL Connector Baud Rate
(7) PARITY - PRINTER/REMOTE CONTROL Connector Parity
(8) DATA PORT - DATA PORT Connector Output

2.5.1 PGM PAT - Programmable Bit Pattern

The PGM PAT function allows a 3- to 24-bit user-programmable test pattern to be programmed into the T-BERD 203. PGM PAT can be used to test a circuit's sensitivity to specific bit patterns. When the bit pattern is transmitted, it is interleaved with the appropriate framing bits. The programmable pattern is selected and generated by pressing the **PATTERN** switch until the Auxiliary PGM PAT function is displayed. The power-up default setting is 1000 0000. When PGM PAT is selected, the current bit pattern appears in the PATTERN display line and the **RESULTS I** and **RESULTS II** switch functions appear in the MODE display line as follows:

AUX	**FORWARD▲**	**REV▼**	**TOGGLE▲**	**END▼**
PGM PAT	**0**0111000011		1000111000111	

Perform the following procedure to change the programmable bit pattern. This procedure is also used to program PGM LPUP and PGM LPDN loop codes.

(1) Press either **RESULTS I** switch arrow to position the cursor under the bit to be changed. The up arrow moves the cursor from left to right (FORWARD▲); the down arrow moves the cursor from right to left (REV▼).

(2) Press the **RESULTS II** switch up arrow (TOGGLE▲) to change the bit between "1" and "0".

(3) Press the **RESULTS I** switch up arrow to position the cursor under the last bit in the code.

(4) Press the **RESULTS II** switch down arrow (END▼) to save the code sequence. *This step must be performed to save the code that was entered.*

NOTE: Pressing the **RESULTS II** switch down arrow (END▼) with the cursor under any bit, except the first three bits, causes the bits to the left to be saved and the bits to the right of the cursor to be deleted.

2.5.2 LP CODE - Loop Code Select

The LP CODE function allows the selection of eight loop codes (four Loop Up and four Loop Down) by pressing the **RESULTS I** switch. The loop codes include six fixed loop codes (FAC1, FAC2, and CSU) and two programmable loop codes (PGM). The displayed loop code is the selected loop code. Press the T-BERD 203 **LOOP UP** or **LOOP DOWN** code switches to send the displayed loop code. The programmable loop codes are programmed through the Auxiliary PGM LPUP and PGM LPDN functions (see Sections 2.5.3 and 2.5.4, respectively). The power-up default setting is PGM. When LP CODE is selected, the current loop-code patterns appear in the PATTERN display line and the **RESULTS I** and **RESULTS II** switch functions appear in the MODE display line as follows:

AUX	**PGM▲ CSU▼**	**FAC1▲ FAC2▼**
LP CODE	**PGM UP 10000**	**DN 100**
AUX	**PGM▲ CSU▼**	**FAC1▲ FAC2▼**
LP CODE	**CSU UP 10000**	**DN 100**
AUX	**PGM▲ CSU▼**	**FAC1▲ FAC2▼**
LP CODE	**FAC1 UP 1100**	**DN 1110**
AUX	**PGM▲ CSU▼**	**FAC1▲ FAC2▼**
LP CODE	**FAC2 UP 11000**	**DN 11100**

Press the **RESULTS I** switch up arrow to select PGM, the down arrow to select CSU. Press the **RESULTS II** switch up arrow to select FAC1, the down arrow to select FAC2.

2.5.3 PGM LPUP - Programmable Loop-Up Code

The PGM LPUP function allows a 3- to 8-bit user-programmable loop-up code to be set. The programmed PGM LPUP is selected through the Auxiliary LP CODE function (see Section 2.5.2) and is generated when the T-BERD 203 **LOOP UP** switch is pressed.

The power-up default setting is determined by the LP CODE function. When PGM LPUP is selected, the current pattern appears in the PATTERN display line and the **RESULTS I** and **RESULTS II** switch functions appear in the MODE display line as follows:

AUX	**FORWARD▲ REV▼**	**TOGGLE▲ END▼**
PGM LPUP	**10000**	

Programming a new loop code is performed in the same manner as setting the user-programmable bit pattern. Refer to Section 2.5.1 for instructions on programming the loop code.

2.5.4 PGM LPDN - Programmable Loop-Down Code

The PGM LPDN function allows a 3- to 8-bit user-programmable loop-up code to be set. The programmed PGM LPDN is selected through the Auxiliary LP CODE function (see Section 2.5.2) and is generated when the T-BERD 203 **LOOP DOWN** switch is pressed. The power-up default setting is determined by the LP CODE function. When PGM LPDN is selected, the current pattern appears in the PATTERN display line and the **RESULTS I** and **RESULTS II** switch functions appear in the MODE display line as follows:

AUX FORWARD▲ REV▼ TOGGLE▲ END▼
PGM LPDN 10000

Programming a new loop code is performed in the same manner as setting the user-programmable bit pattern. Refer to Section 2.5.1 for instructions on programming the loop code.

2.5.5 LP FRM - Loop-Code Framing Criteria

The LP FRM function controls the method of framing (overwrite or interleave the code with the framing pattern) used to transmit the loop codes. The OVWRIT (overwrite) code selection causes a loop-code bit to be replaced by a frame bit every 193 bits. The IMBED (imbedded) code selection causes the frame and loop-code bits to be interleaved. When LP FRM is selected, the following display appears:

AUX OVWRIT▲ IMBED▼
LP FRM FRM OVERWRITE

Press the **RESULTS I** switch up arrow to select FRM OVERWRITE (frame overwrite) and the down arrow to select FRM IMBEDDED (frame imbedded). FRM OVERWRITE is the power-up default setting.

2.5.6 BAUD - PRINTER/REMOTE CONTROL Connector Baud Rate

The BAUD function controls the PRINTER/REMOTE CONTROL interface baud rate. Data can be transmitted and received at 300, 1200, 2400, or 4800 baud. When BAUD is selected, the following display appears:

```
AUX      300▲ 1200▼  2400▲ 4800▼
BAUD     4800 BAUD
```

Press the **RESULTS I** switch up arrow to select 300 baud, the down arrow to select 1200 baud. Press the **RESULTS II** switch up arrow to select 2400 baud, the down arrow to select 4800 baud. The power-up default is determined by the T-BERD 305 BAUD DIP switches (SW 1 and 2). The baud rate should be selected from the T-BERD 305 to prevent a mismatch between the T-BERD 203 and the attached device.

2.5.7 PARITY - PRINTER/REMOTE CONTROL Connector Parity

The PARITY function selects the PRINTER/REMOTE CONTROL interface parity. The port can be configured to transmit and receive data with EVEN, ODD or no (NONE) parity. When PARITY is selected, the following display appears:

```
AUX      EVEN▲ ODD▼  NONE▲
PARITY   PARITY EVEN
```

Press the **RESULTS I** switch up arrow to select EVEN parity, the down arrow to select ODD parity. Selecting odd or even parity automatically sets the word length to seven bits. Press the **RESULTS II** switch up arrow to select NONE. Selecting no parity automatically sets the word length to eight bits. The power-up default is determined by the T-BERD 305 PARITY DIP switch (SW 3). Parity should be selected from the T-BERD 305 to prevent a mismatch between the T-BERD 203 and the attached device.

2.5.8 DATA PORT - DATA PORT Connector Output

The DATA PORT function selects the output (DS0 or data link) of the DATA PORT connector. The port can provide a DS0 channel output or a data link output for ESF, ESFz, and SLC formatted data. When DATA PORT is selected, the following display appears:

```
AUX          DS0▲          DATALINK▼
DATA PORT    SEL DS0
```

Press the **RESULTS I** switch up arrow to select DS0 and the down arrow to select DATALINK. The power-up default is DS0. Refer to Section 2.4.3 for additional information on the connector.

2.6 MEASUREMENTS

The T-BERD 203 performs a variety of instantaneous measurements providing bit, frame, CRC, and BPV error counts, error rates, errored seconds, and received frequency results at the T1 level. Test results are accumulated after the initial frame or pattern synchronization occurs and are displayed above the **RESULTS I** and **RESULTS II** switches. Two results can be displayed at the same time by pressing either **RESULTS** switch. Table 2-3 lists the displayed result names and descriptions of each result.

Table 2-3
Test Results

Displayed Result	Description
00 - BIT ERRORS	Bit Errors - Received bits which have a value (Mark or Space) opposite that of the corresponding transmitted bits after pattern synchronization is achieved.
01 - ASYN ER SEC	Asynchronous Errored Seconds - A count of test seconds during which one or more bit errors occurred.
04 - BIT ERR RT	Bit Error Rate - The ratio of bit errors detected to the total number of received data bits after pattern synchronization is achieved.
06 - %EFS	Percentage of Error-Free Seconds - The ratio, expressed as a percentage, of error-free seconds to the total number of seconds during which pattern synchronization was present.
07 - SYN ERR SEC	Synchronized Errored Seconds - A count of errored seconds synchronized to the occurrence of an error (the count and time interval begin with the occurrence of an error).
08 - OUT SYN SEC	Out of Synchronization Seconds - A count of seconds since initial synchronization during which one or more pattern synchronization losses occurred or during which pattern synchronization could not be achieved.

Table 2-3
Test Results (Continued)

Displayed Result	Description
09 - SLIPS	Pattern Slips - A count of the total number of pattern slips occurring since the beginning of the test.
10 - SEV ERR SEC	Severely Errored Seconds - A count of seconds during which the number of bit errors equalled 1,544 or more (10^{-3} error rate).
16 - CSES	Consecutive Severely Errored Seconds - A count of the number of groups of three or more contiguous seconds in which each second contains 1,544 or more bit errors.
25 - BPVs	Bipolar Violations - A count of the number of BPVs detected since elapsed seconds began. B8ZS coding is excluded from the result.
26 - BPV SEC	BPV Seconds - A count of the number of seconds which have BPVs since elapsed seconds began.
27 - BPV RATE	BPV Rate - The ratio of BPVs to the number of data bits received since the start of the test.
28 - FRM ERR SEC	Frame Errored Seconds - A count of seconds during which one or more frame errors occurred.
29 - FRM SES	Framed Severely Errored Seconds - A count of seconds during which the total number of frame errors equalled 12 or more.
30 - FRM ERRORS	Frame Errors - Frame errors are counted if either an F_t or an F_s frame bit is in error for D4 framing. In T1 SLC mode, frame errors are counted only if an error is found on an F_t bit.
31 - FRM ERR RT	Frame Error Rate - The ratio of frame errors to the number of analyzed framing bits.
32 - CRC ERRORS	CRC Errors - A count of CRC errors detected. Counted only in ESF and ESFz framed T1 circuits.
33 - CRC ERR SEC	CRC Errored Seconds - A count of seconds within which one or more CRC errors was detected.
35 - FRM LOS SEC	Frame Loss Seconds - A count of seconds since initial frame synchronization during which one or more frame synchronization losses occurred or during which frame synchronization could not be achieved.

Table 2-3
Test Results (Continued)

Displayed Result	Description
36 - CRC SES	CRC Severely Errored Seconds - A count of seconds during which the total number of CRC errors and frame losses equalled 320 or more.
37 - CRC ERR RT	CRC Error Rate - The ratio of CRC errors to the total number of ESF superframes analyzed.
40 - RX FREQ, Hz	Received Frequency in Hertz - The frequency of the recovered clock from the received data.
44 - SIG LOS SEC	Signal Loss Seconds - A count of test seconds during which the signal was not present or during which one or more signal losses occurred.
54 - ELAPSE TIME	Elapsed Time - Indicates the length of a test in hours, minutes, and seconds since (1) a test restart or (2) the last major switch change occurred.
A: 110010 100010 111101 101101 B: 110010 100010 111101 101101 C: 110010 100010 111101 101101 D: 110010 100010 111101 101101	T1 Channel Signaling Status - The display indicates the T1 channel signaling status (e.g., on/off hook conditions) of all the T1 channels simultaneously. A and B signaling status is provided for T1 D4 and T1 SLC framed signals. A, B, C, and D signaling status is provided for T1 ESF and T1 ESFz framed signals. Press the **RESULT I** switch to display the A and B or C and D signaling bits. N/A replaces the signaling status when the signaling bits do not apply to the selected framing mode. An individual channel's signaling bits can be selected using the **DS0 CHANNEL SELECT** switch and displayed on the signaling LEDs (labeled A, B, C, and D).

Results that apply to a test mode but have not been calculated display **UNAVAILABLE** in place of the result. Results which are not applicable to the selected mode and pattern display **N/A** in place of the result.

All bit error results are dependent upon the T-BERD 203 obtaining initial pattern synchronization with the received test pattern. During a test when pattern synchronization is lost, the bit error count halts, then continues when pattern synchronization is regained. The bit error count is updated each time bit errors are detected in the received test pattern.

The bipolar violations (BPVs) results are frozen when the signal is lost (SIGNAL LOSS LED illuminates). Pattern and frame synchronization losses do not affect BPV results.

The framing results are used to monitor the in-service T-Carrier spans. For the frame error count, the T-BERD 203 analyzes the framing information embedded in the T1 signal. Framing bit errors in D4 framed signals are detected and used as the basis for calculating the error rate (FRM ERR RT) and severely errored seconds (FRM SES). The number of seconds where frame synchronization was lost is also accumulated. For ESF and ESFz formatted T1 circuits, the T-BERD 203 detects and accumulates CRC-6 errors; the CRC errors are then used to calculate the CRC error rate and accumulate CRC errored seconds and CRC severely errored seconds.

The signal and time results are based on the measurement of elapsed time, received frequency, and signal loss seconds. The Alarm Status LEDs also provide continuous indications on signal loss, pattern loss, frame loss, excess zeros, yellow alarm, and all ones conditions. The current signal status is continuously displayed, while the HISTORY LEDs are illuminated at the first occurrence of an alarm condition and remain on after the alarm condition has ended.

Table 2-4 provides a key to the relationship between the framing modes, patterns, and test results. The framing modes and patterns are listed across the top and the test results are listed down the left side. Xs indicate available results for a given framing mode and pattern.

Table 2-4
T1 Modes and Patterns vs. Results

Results	Modes: T1 (Unframed) — Patterns: QRSS	3 IN 24	ALL ONES	PRBS PAT	2^23-1	2^20-1	Modes: T1 D4 — Patterns: QRSS	3 IN 24	ALL ONES	PRBS PAT	2^23-1	2^20-1	Modes: T1 ESF — Patterns: QRSS	3 IN 24	ALL ONES	PRBS PAT	2^23-1	2^20-1	Modes: T1 ESFz — Patterns: QRSS	3 IN 24	ALL ONES	PRBS PAT	2^23-1	2^20-1	Modes: T1 SLC — Patterns: QRSS	3 IN 24	ALL ONES	PRBS PAT	2^23-1	2^20-1
*00 - BIT ERRORS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
*01 - ASYN ER SEC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
*04 - BIT ERR RT	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
*06 - %EFS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
*07 - SYN ERR SEC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
*08 - OUT SYN SEC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
*09 - SLIPS	X				X	X	X	-	-	-	X	X	X	-	-	-	X	X	X	-	-	-	X	X	X	-	-	-	X	X
*10 - SEV ERR SEC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
*16 - CSES	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
25 - BPVs	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
26 - BPV SEC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
27 - BPV RATE	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
28 - FRM ERR SEC							X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X
29 - FRM SES							X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X
30 - FRM ERRORS							X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X
31 - FRM ERR RT							X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X
32 - CRC ERRORS							-	-	-				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-
33 - CRC ERR SEC							-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-
35 - FRM LOS SEC							X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
36 - CRC SES							-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-
37 - CRC ERR RT							-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-
40 - RX FREQ, Hz	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
44 - SIG LOS SEC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
54 - ELAPSE TIME	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
A /B Signaling							X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
C /D Signaling							-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-

* = Result not available when performing in-service monitoring
X = Results available with indicated pattern and mode
- = Results not available (N/A) with indicated pattern and mode

PREPARATION FOR USE

3.1 INTRODUCTION

This section provides information on unpacking and inspecting the instrument, equipment supplied with the instrument, and an instrument checkout procedure.

3.2 UNPACKING

The T-BERD 203 shipping container should be inspected for damage when it is received. If the shipping container or shipping material is damaged, it should be kept until the contents have been checked for completeness and the instrument has been checked mechanically and electrically. Procedures for checking the electrical performance of the instrument begin with Section 3.4. If the contents are incomplete, or if the T-BERD 203 does not pass the instrument checkout procedures, the customer should notify TTC. If the shipping container is damaged, notify the carrier and TTC, and keep the shipping container and materials for the carrier's inspection.

3.3 EQUIPMENT INCLUDED

The following is a list of the equipment that should be present when the T-BERD 203 is received and unpacked.

(1) T-BERD 203
(2) Hinge Installation Kit
(3) Operating Manual
(4) Loopback Cable

NOTE: The T-BERD 305 must have software revision level "I" or greater to properly operate with the T-BERD 203. To verify the current software revision level, power-up the unit; the revision level is displayed as "TTC REV n" where n is the revision letter.

3.4 INSTRUMENT CHECKOUT

The T-BERD 203 should be checked mechanically and electrically after unpacking as recommended in Section 3.2. Before the T-BERD 203 can be checked out, a working T-BERD 305 (software revision level "I" and DS1 Drop Option) is required.

WARNING: Before connecting the T-BERD 203 to a T-BERD 305 verify that the T-BERD 305 has a serial number greater than 4456. T-BERD 305s with serial numbers less than 4456 must be retrofitted to accommodate the additional power requirements and software of the T-BERD 203. Connecting the T-BERD 203 to a T-BERD 305 that has not been retrofitted will damage the T-BERD 305. Contact TTC for information on upgrading the T-BERD 305.

To verify proper electrical operation of the T-BERD 305, refer to Section 3 and the Instrument Checkout procedure in the T-BERD 305 Operating Manual.

To verify the proper operation of the T-BERD 203, perform the following procedure.

(1) Install the T-BERD 203 on the T-BERD 305 in accordance with the installation instructions provided in the shipping container and Appendix B of this manual.

(2) With the T-BERD 305 powered off, remove the T-BERD 203 extension cable from the storage tray and connect it to the T-BERD 305 RS-232 INTERFACE connector (on rear panel).

(3) Apply power to the T-BERD 305. The T-BERD 203 and T-BERD 305 perform an internal self-test which illuminates all the front panel indicators, tests the position of all the switches, establishes the communication link between the two units, and loads the front panel configuration (switches and menu functions) from memory. The T-BERD 203 can only load the power-up factory defaults shown in Table 3-1.

(4) Plug the loopback cable (supplied with instrument) into the T-BERD 203 TRANSMIT OUTPUT and RECEIVE INPUT jacks.

(5) Press the **RESTART** switch to restart the instrument. Verify that the T1 PULSES, PATTERN SYNC, and FRAME SYNC LEDs illuminate, the 00- BIT ERRORS result indicates zero bit errors, and the 30- FRM ERRORS result indicates zero frame errors.

(6) Press the **ERROR INSERT** switch several times to insert logic errors and verify that they appear in the 00- BIT ERRORS result.

(7) Remove the loopback cable from the TRANSMIT OUTPUT and RECEIVE INPUT jacks. Verify that the SIGNAL LOSS, PATTERN LOSS, and FRAME LOSS alarm LEDs illuminate. Verify that the T1 PULSES, PATTERN SYNC, and FRAME SYNC LEDs go off.

Table 3-1
T-BERD 203 Front Panel Default Settings

Front Panel Switch	Default Setting
MODE	T1 D4
PATTERN	QRSS
RESULTS I & II Display	00- BIT ERRORS and 30- FRM ERRORS
TIMING	INTERNAL
ERROR INSERT	OFF
LOOP CODES	OFF
DS0 CHANNEL SELECT	24
Auxiliary Function	**Default Setting**
PGM PAT	1000 0000
LP CODE	PGM
PGM LPUP	10000
PGM LPDN	100
LP FRM	OVERWRITE
BAUD	T-BERD 305 DIP switch
PARITY	T-BERD 305 DIP switch
DATAPORT	DS0

TEST PROCEDURES

4.1 INTRODUCTION

This section contains step-by-step procedures for in-service monitoring and out-of-service end-to-end and loopback testing of DS1 signals from DS1 and DS3 DSX access points. The T-BERD 203 can test DS1 signals from DS1 DSX cross connects directly or from DS3 DSX cross connects using the T-BERD 305 to demultiplex the DS3 signal.

The following procedures assume that the user is familiar with the location and operation of the T-BERD 203 and T-BERD 305 front panel controls and indicators.

4.2 INITIAL INSTRUMENT SET UP

Perform the procedure in Table 4-1 to connect the T-BERD 203 to the T-BERD 305. If required, connect a serial printer or remote control device to the T-BERD 203 PRINTER/REMOTE CONTROL connector or connect another data analyzer to the DATA PORT connector to analyze either a DS0 channel or ESF or SLC data signal.

WARNING: Connecting the T-BERD 203 extension cable to the T-BERD 305 RS-232 INTERFACE connector should only be done after power has been removed from the T-BERD 305. Installing the cable while power is applied could cause damage to both instruments.

CAUTION: Do not attempt to close the T-BERD 203 with the T-BERD 203 extension cable connected to the T-BERD 305. Always disconnect and store the extension cable in the T-BERD 203 storage tray when the T-BERD 305/203 is not in use.

4.3 IN-SERVICE MONITORING

This section describes how to perform in-service monitoring with the T-BERD 305/203 from either DS3 or DS1 DSX patch bays. The T-BERD 305/203 can receive live data from either a DS3 or DS1 monitor jack and provide simultaneous BPV, parity, frame, and signal performance results.

Table 4-1
Initial T-BERD 305/203 Set Up

Step	Controls/Indicators/ Connectors	Instructions/ Comments
1.	305 Extension Stands	Pull out bottom and rear panel stands.
2.	Cover	Unlatch and open.
3.	305 POWER switch (POWER OFF)	Verify switch is released (OUT=power off, IN=power on).
4.	305 AC Power cord	Plug into T-BERD 305 rear panel AC connector.
5.	203 Extension cable	Remove from storage tray and connect to T-BERD 305 RS-232 INTERFACE connector.
6.	203 DATA PORT	If required, connect an RS-232 compatible connector data analyzer to provide further analysis capabilities (see Section 2.4.3).
7.	203 PRINTER/ REMOTE CONTROL	If required, connect an RS-232 serial printer for printouts. (see Section 5, connector Printer Operation). If required, connect remote control device for remote control operation (see Section 6, Remote Control Operation).
8.	305 AC Power cord	Plug into AC receptacle.
9.	305 **POWER** switch (POWER ON)	Press in to apply power.
10.	305 **ERROR INSERT** switch	Verify switch not illuminated. If illuminated, press to disable error insertion (LED goes off).
11.	305 **DISPLAY HOLD** switch	Verify switch not illuminated. If illuminated, press to disable display hold (LED goes off).
12.	a) In-Service Monitoring b) Out-of-Service Testing	Go to Section 4.3. Go to Section 4.4.

4.3.1 DS1/DS3 Monitoring from a DS3 Access Point

In this procedure the T-BERD 305 receives a DS3 signal without interrupting data flow. The DS3 signal is analyzed and demultiplexed through the DS1 Drop Option. The dropped DS1 signal is then analyzed with the T-BERD 203. Figure 4-1 diagrams the connections required to monitor a DS1 signal from a DS3 DSX patch bay. Table 4-2 describes how to set up the T-BERD 305/203 to perform in-service monitoring of the DS1 signal from a DS3 access point. The following procedures are divided into three sections: T-BERD 305 set up, T-BERD 203 set up, and results accumulation and monitoring. If monitoring the span in one direction does not indicate signal impairments, jack into the other side of the span to check the other direction and repeat the procedure.

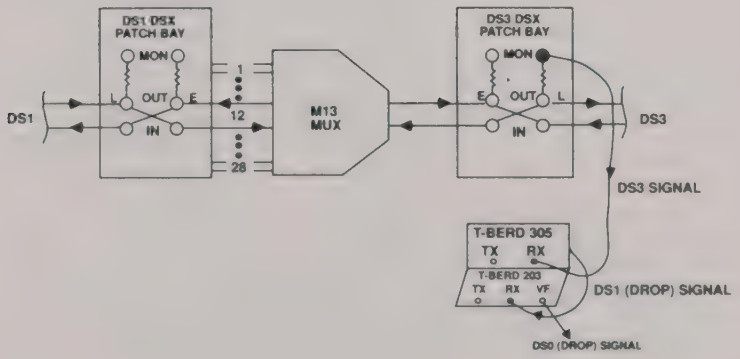

Figure 4-1
DS1/DS3 Monitoring from a DS3 Access Point

Table 4-2
DS1/DS3 Monitoring from a DS3 Access Point

Step	Controls/Indicators/ Connectors	Instructions/ Comments
1.	Initial Instrument Set Up	Perform as required (see Table 4-1).
2.	305 DS1 DROP OUTPUT/ 203 RECEIVE INPUT jacks	Connect WECO 310 plug cable (use T-BERD 203 loopback cable) between jacks (see Figure 4-1).
3.	305 **TIMING** switch	Select RECOVD (LOOP) timing (LED illuminates).
4.	305 **TEST** switch	Select desired test length: TIMED or CONTINUOUS.
5.	305 **RECEIVE INPUT** switch	Select DSX position (LED illuminates).
6.	305 RECEIVE INPUT/ DS3 patch bay MONITOR jacks	Connect 440 plug cable between jacks (Line or Equipment side). Note direction of signal being monitored (see Figure 4-1).
7.	305 **CATEGORY** switch	Select AUX position (LED illuminates).
8.	305 **RESULT (SCROLL)** switch	Scroll through Auxiliary functions. Select applicable setting with 305 **UP/DOWN** switch.
	ERR INS RT	N/A.
	BURST DUR	N/A.
	ERR THR	1E-2 to 1E-9.
	FRAMING	M13 or C-BIT (match multiplexer requirements).
	XBIT	0, 1, or A (C-bit framing only).
	DS1 DROP	1 to 28 (select DS1 signal being monitored).
	ERR TYP	N/A.
	EXT CLOCK	OFF.
	MUX TX	N/A.
	T1 FRAME TX	D4 or ESF (match 203 framing mode).
9.	203 **MODE** switch	Select framing mode.
	T1	Unframed T1.
	T1 D4	D4 superframe.
	T1 ESF	Extended Superframe.

Table 4-2
DS1/DS3 Monitoring from a DS3 Access Point (Continued)

Step	Controls/Indicators/ Connectors	Instructions/ Comments
9. cont.	T1 ESFz T1 SLC AUX	ESF with ZBTSI encoding. Must be selected for SLC formatted DS1 signals. N/A.
10.	203 **TIMING** switch	Select RECOVD (LOOP) timing (LED illuminates).
11.	203 **DS0 CHANNEL SELECT** switch	Select desired DS0 channel (1-24).
12.	**RESTART/HISTORY RESET** switches	Restart both instruments clearing results and HISTORY LEDs.
13.	305 STATUS SIGNAL PRES PATTERN SYNC FRAME SYNC	Check Receive Signal Status. DS3 Signal detected. N/A. Frame synchronization acquired.
14.	305 ALARMS SIGNAL LOSS PATTERN LOSS FRAME LOSS BLUE SIGNAL	Check Alarms. LEDs should not illuminate. If illuminated, further analysis is required. Loss of signal. N/A. Loss of frame synchronization. Blue signal detected.
15.	305 **CATEGORY/RESULT** switches LOGIC BPV PARITY FRAME SIGNAL TIME	Select category with **CATEGORY** switch. Scroll selected category with **RESULT (SCROLL)** switch. N/A. Bipolar violation results. Parity, C-bit, and FEBE results. Frame, FEOOF, and NEOOF results. Signal losses, clock frequencies, level, and power results. Test times, time of day, and date.
16.	203 Receive Signal Status T1 PULSES	Check Receive Signal LEDs. T1 signal detected.

Table 4-2
DS1/DS3 Monitoring from a DS3 Access Point (Continued)

Step	Controls/Indicators/ Connectors	Instructions/ Comments
16. cont.	PATTERN SYNC	N/A.
	FRAME SYNC	Frame synchronization acquired.
	B8ZS	N/A.
17.	203 Alarm	Check Alarms. LEDs should not illuminate. If illuminated, further analysis is required.
	SIGNAL LOSS	Loss of signal.
	PATTERN LOSS	N/A.
	FRAME LOSS	Loss of frame synchronization.
	EXCESS ZEROS	Excess zeros detected.
	YELLOW ALARM	Yellow alarm detected.
	ALL ONES	All ones detected.
	ERROR EVENT	Error event detected. Go to Step 18.
18.	203 **RESULTS** switches	Scroll through available DS1 results. N/A indicates result not applicable to set up. UNAVAILABLE indicates result applicable to set up but not calculated yet.
	00- BIT ERRORS	N/A
	01- ASYN ER SEC	N/A
	04- BIT ERR RT	N/A
	06- % EFS	N/A
	07- SYN ERR SEC	N/A
	08- OUT SYN SEC	N/A
	09- SLIPS	N/A
	10- SEV ERR SEC	N/A
	16- CSES	N/A
	25- BPVs	Bipolar Violations
	26- BPV SEC	BPV Seconds
	27- BPV RATE	BPV Rate
	28- FRM ERR SEC	Frame Errored Seconds
	29- FRM SES	Framed Severely Errored Seconds
	30- FRM ERRORS	Frame Errors
	31- FRM ERR RT	Frame Error Rate
	32- CRC ERRORS	CRC Errors
	33- CRC ERR SEC	CRC Errored Seconds
	35- FRM LOS SEC	Frame Loss Seconds
	36- CRC SES	CRC Severely Errored Seconds
	37- CRC ERR RT	CRC Error Rate
	40- RX FREQ,Hz	Received Frequency in Hertz

Table 4-2
DS1/DS3 Monitoring from a DS3 Access Point (Continued)

Step	Controls/Indicators/ Connectors	Instructions/ Comments
18. cont.	44- SIG LOS SEC 54- ELAPSE TIME A/B/C/D	Signal Loss Seconds Elapsed Time (starts with test restart) 24 Channel T1 Signaling Status
19.	203 LEVEL meter/CLIPPING LED	Observe selected channel signal for level and clipping.
20.	203 DATA BITS/ABCD LEDs	Observe selected channel data and signaling bits as required.
21.	203 Speaker/VF output	Observe as required. Adjust speaker volume control. VF OUT jack available for additional VF testing.

4.3.2 DS1 Monitoring from a DS1 Access Point

In this procedure the T-BERD 203 receives a DS1 signal without interrupting data flow. The DS1 signal is then analyzed with the T-BERD 203. Figure 4-2 diagrams the connections required to monitor a DS1 signal from a DS1 DSX patch bay. Table 4-3 describes how to set up the T-BERD 305/203 to perform in-service monitoring of the DS1 signal from a DS1 access point. The following procedures are divided into two sections: T-BERD 203 set up and results accumulation and monitoring. This procedure does not involve the T-BERD 305 except to provide power and printer control for the T-BERD 203. If monitoring the span in one direction does not indicate signal impairments, jack into the other side of the span to check the other direction and repeat the procedure.

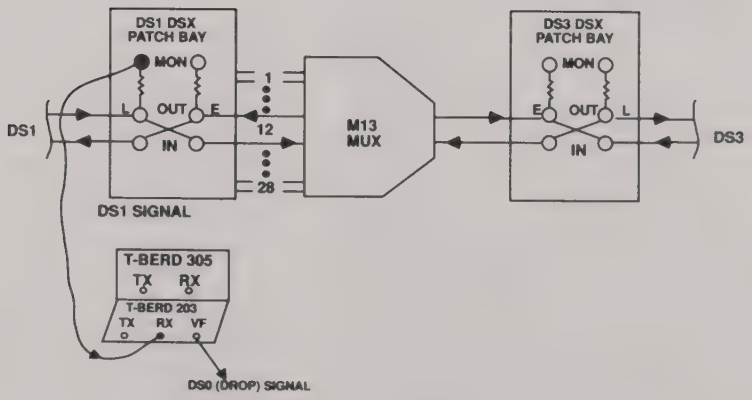

Figure 4-2
DS1 Monitoring from a DS1 Access Point

Table 4-3
DS1 Monitoring from a DS1 Access Point

Step	Controls/Indicators/ Connectors	Instructions/ Comments
1.	Initial Instrument Set Up	Perform as required (see Table 4-1).
2.	203 RECEIVE INPUT/ DS1 patch bay MONITOR jacks	Connect WECO 310 plug cable between jacks (Line or Equipment side). Note direction of signal monitored (see Figure 4-2).
3.	203 **MODE** switch	Select framing mode.
	T1	Unframed T1.
	T1 D4	D4 superframe.
	T1 ESF	Extended Superframe.
	T1 ESFz	ESF with ZBTSI encoding.
	T1 SLC	Must be selected for SLC formatted DS1 signals.
	AUX	N/A.
4.	203 **TIMING** switch	Select RECOVD (LOOP) timing (LED illuminates).
5.	203 **DS0 CHANNEL SELECT** switch	Select desired DS0 channel (1-24).
6.	**RESTART/HISTORY RESET** switches	Restart instrument clearing results and HISTORY LEDs.
7.	203 Receive Signal Status	Check Receive Signal LEDs.
	T1 PULSES	T1 signal detected.
	PATTERN SYNC	N/A.
	FRAME SYNC	Frame synchronization acquired.
	B8ZS	B8ZS encoding detected.
8.	203 Alarm	Check Alarms. LEDs should not illuminate. If illuminated, further analysis is required.
	SIGNAL LOSS	Loss of signal.
	PATTERN LOSS	Loss of pattern synchronization.
	FRAME LOSS	Loss of frame synchronization.
	EXCESS ZEROS	Excess zeros detected.
	YELLOW ALARM	Yellow alarm detected.
	ALL ONES	All ones detected.
	ERROR EVENT	Error event detected. Go to Step 9.

Table 4-3
DS1 Monitoring from a DS1 Access Point (Continued)

Step	Controls/Indicators/ Connectors	Instructions/ Comments
9.	203 **RESULTS** switches	Scroll through available DS1 results. N/A indicates result not applicable to set up. UNAVAILABLE indicates result applicable to set up but not calculated yet.
	00- BIT ERRORS	N/A
	01- ASYN ER SEC	N/A
	04- BIT ERR RT	N/A
	06- % EFS	N/A
	07- SYN ERR SEC	N/A
	08- OUT SYN SEC	N/A
	09- SLIPS	N/A
	10- SEV ERR SEC	N/A
	16- CSES	N/A
	25- BPVs	Bipolar Violations
	26- BPV SEC	BPV Seconds
	27- BPV RATE	BPV Rate
	28- FRM ERR SEC	Frame Errored Seconds
	29- FRM SES	Framed Severely Errored Seconds
	30- FRM ERRORS	Frame Errors
	31- FRM ERR RT	Frame Error Rate
	32- CRC ERRORS	CRC Errors
	33- CRC ERR SEC	CRC Errored Seconds
	35- FRM LOS SEC	Frame Loss Seconds
	36- CRC SES	CRC Severely Errored Seconds
	37- CRC ERR RT	CRC Error Rate
	40- RX FREQ, Hz	Received Frequency in Hertz
	44- SIG LOS SEC	Signal Loss Seconds
	54- ELAPSE TIME	Elapsed Time (starts with test restart)
	A/B/C/D	24 Channel T1 Signaling Status
10.	203 LEVEL meter/ CLIPPING LED	Observe selected channel signal for level and clipping.
11.	203 DATA BITS/ABCD LEDs	Observe selected channel signal data and signaling bits as required.
12.	203 Speaker/VF output	Observe as required. Adjust speaker volume control. VF OUT jack available for additional VF testing.

4.4 OUT-OF-SERVICE TESTING

This section describes how to perform out-of-service end-to-end or loopback testing with the T-BERD 305/203 from either DS1 or DS3 DSX access points. The T-BERD 305/203 can be configured to transmit either a demultiplexable DS3 test pattern (made of 28 DS1 signals) from a DS3 DSX or a DS1 framed test pattern from a DS1 DSX. The received signal is then analyzed by the T-BERD 305 and/or T-BERD 203 for logic errors, BPVs, frame errors, parity errors, and signal performance.

If an end-to-end test is performed with another T-BERD 305/203 at a remote location, repeat the procedures at the remote location. The T-BERD 305/203 at both locations can be set up from either a DS1 or DS3 access point.

If a remote loopback test is required, establish the loop at an appropriate point in the circuit before performing the following procedures. When testing from a DS3 access point, the loopback needs to be established manually. When testing from a DS1 access point, the T-BERD 203 can establish a loopback at a DS1 CSU, smart jack, or facility loopback unit (FLU) using the **LOOP CODES** switches. The T-BERD 203 provides three fixed loop codes and the capability of programming loop codes required by other looping devices (see Section 2.5.2).

Once the T-BERD 305/203 is set up, the remote location established, and the instrument indicates a signal presence, verify the validity of the received signal by pressing the ERROR INSERT switch and checking the LOGIC results from the T-BERD 305 or BIT ERRORS results from the T-BERD 203.

4.4.1 DS1 Testing from a DS3 Access Point

In this procedure the T-BERD 305 transmits a demultiplexable DS3 test pattern over the network. The received DS3 signal is analyzed and then demultiplexed through the DS1 Drop Option. The dropped DS1 signal is then analyzed with the T-BERD 203. Figure 4-3 diagrams the connections required to test a DS1 signal from a DS3 DSX patch bay. Table 4-4 describes how to set up the T-BERD 305/203 to perform out-of-service testing of a DS1 signal from a DS3 access point. The following procedures are divided into three sections: T-BERD 305 set up, T-BERD 203 set up, and results accumulation and testing. Performing tests from a DS3 access point disrupts the entire DS3 signal. If testing the span in one direction does not indicate signal impairments, jack into the other side of the span to check the other direction and repeat the procedure.

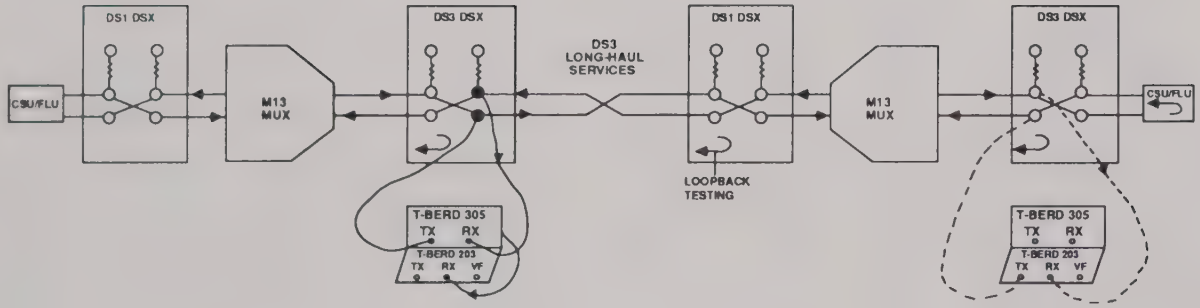

Figure 4-3
Out-of-Service DS1 Testing from a DS3 Access Point

Table 4-4
Out-of-Service DS1 Testing from a DS3 Access Point

Step	Controls/Indicators/ Connectors	Instructions/ Comments
1.	Remote End Set Up	Establish remote loopback or end-to-end test by repeating procedure at remote end.
2.	Initial Instrument Set Up	Perform as required (see Table 4-1).
3.	305 DS1 DROP OUTPUT/ 203 RECEIVE INPUT jacks	Connect WECO 310 plug cable (use T-BERD 203 loopback cable) between jacks (see Figure 4-3).
4.	305 **TIMING** switch	Select INTERNAL timing.
5.	305 **TEST** switch	Select desired test length: TIMED or CONTINUOUS.
6.	305 **RECEIVE INPUT** switch	Select DSX position (LED illuminates).
7.	305 **TRANSMIT OUTPUT** switch	Select DSX position (LED illuminates).
8.	a) Line Side Test Connections b) Equipment Side Test Connections	Go to Step 9. Go to Step 10.
9.	Line Side Testing (see Figure 4-3)	Testing span.
	a) 305 RECEIVE INPUT/ DS3 patch bay OUT jack	Connect 440 plug cable between jacks. Note direction of signal being tested.
	b) 305 TRANSMIT OUTPUT/DS3 patch bay IN jack	Connect 440 plug cable between jacks. Note direction of signal being tested.
10.	Equipment Side Testing	Testing equipment.
	a) 305 RECEIVE INPUT/ DS3 patch bay OUT jack	Connect 440 plug cable between jacks. Note direction of signal being tested.
	b) 305 TRANSMIT OUTPUT/ DS3 patch bay IN jack	Connect 440 plug cable between jacks. Notedirection of signal being tested.
11.	305 **CATEGORY** switch	Select AUX position (LED illuminates).

Table 4-4
Out-of-Service DS1 Testing from a DS3 Access Point
(Continued)

Step	Controls/Indicators/ Connectors	Instructions/ Comments
12.	305 **RESULT (SCROLL)** switch	Scroll through Auxiliary functions. Select applicable setting with 305 **UP/DOWN** switch.
	ERR INS RT	1E-2 to 1E-9.
	BURST DUR	25 ms to 5 s.
	ERR THR	1E-2 to 1E-9.
	FRAMING	M13 or C-BIT (match multiplexer requirements).
	XBIT	0, 1, or A (C-bit framing only).
	DS1 DROP	1 to 28 (select DS1 channel).
	ERR TYP	LOGIC, BPV, or BOTH.
	EXT CLOCK	OFF or ON.
	MUX TX	QRSSn (n=1-28, select DS1 channel), QRSS ALL, or 3-24 ALL.
	T1 FRAME TX	D4 or ESF (match 203 framing mode).
13.	203 **MODE** switch	Select framing mode.
	T1	Unframed T1.
	T1 D4	D4 superframe.
	T1 ESF	Extended Superframe.
	T1 ESFz	ESF with ZBTSI encoding.
	T1 SLC	Must be selected for SLC formatted DS1 signals.
	AUX	See Paragraph 2.5.
14.	203 **PATTERN** switch	Select QRSS or 3 IN 24 test pattern matching 305 MUX TX test pattern (see Step 12).
15.	203 **TIMING** switch	Select RECOVD (LOOP) timing (LED illuminates).
16.	**RESTART/HISTORY RESET** switches	Restart both instruments clearing results and HISTORY LEDs.
17.	305 STATUS	Check Receive Signal Status.
	SIGNAL PRES	DS3 Signal detected.
	PATTERN SYNC	N/A.

Table 4-4
Out-of-Service DS1 Testing from a DS3 Access Point
(Continued)

Step	Controls/Indicators/ Connectors	Instructions/ Comments
	FRAME SYNC	Frame synchronization acquired.
18.	305 ALARMS	Check Alarms. LEDs should not illuminate. If illuminated, further analysis is required.
	SIGNAL LOSS	Loss of signal.
	PATTERN LOSS	N/A.
	FRAME LOSS	Loss of frame synchronization.
	BLUE SIGNAL	Blue signal detected.
19.	305 **CATEGORY/RESULT** switches	Select category with **CATEGORY** switch. Scroll selected category with **RESULT (SCROLL)** switch.
	LOGIC	N/A.
	BPV	BPV errors, rates, and seconds.
	PARITY	Parity, C-bit, and FEBE errors, rates, and seconds.
	FRAME	Frame errors, rates, seconds, FEOOF and NEOOF seconds.
	SIGNAL	Signal losses, clock frequencies, levels.
	TIME	Test times, time of day, and date.
20.	203 Receive Signal Status	Check Receive Signal LEDs.
	T1 PULSES	T1 signal detected.
	PATTERN SYNC	Pattern synchronization acquired.
	FRAME SYNC	Frame synchronization acquired.
	B8ZS	N/A.
21.	203 Alarm	Check Alarms. LEDs should not illuminate. If illuminated, further analysis is required.
	SIGNAL LOSS	Loss of signal.
	PATTERN LOSS	Loss of pattern synchronization.
	FRAME LOSS	Loss of frame synchronization.
	EXCESS ZEROS	Excess zeros detected.
	YELLOW ALARM	Yellow alarm detected.
	ALL ONES	All ones detected.
	ERROR EVENT	Error event detected. Go to Step 22.

Table 4-4
Out-of-Service DS1 Testing from a DS3 Access Point
(Continued)

Step	Controls/Indicators/ Connectors	Instructions/ Comments
22.	203 **RESULTS** switches	Scroll through available DS1 results. N/A indicates result not applicable to set up. UNAVAILABLE indicates result applicable to set up but not calculated yet.
	00- BIT ERRORS	Bit Errors
	01- ASYN ER SEC	Asynchronous Errored Seconds
	04- BIT ERR RT	Bit Error Rate
	06- % EFS	Percentage of Error-Free Seconds
	07- SYN ERR SEC	Synchronized Errored Seconds
	08- OUT SYN SEC	Out of Synchronization Seconds
	09- SLIPS	Pattern Slips
	10- SEV ERR SEC	Severely Errored Seconds
	16- CSES	Consecutive Severely Errored Seconds
	25- BPVs	Bipolar Violations
	26- BPV SEC	BPV Seconds
	27- BPV RATE	BPV Rate
	28- FRM ERR SEC	Frame Errored Seconds
	29- FRM SES	Framed Severely Errored Seconds
	30- FRM ERRORS	Frame Errors
	31- FRM ERR RT	Frame Error Rate
	32- CRC ERRORS	CRC Errors
	33- CRC ERR SEC	CRC Errored Seconds
	35- FRM LOS SEC	Frame Loss Seconds
	36- CRC SES	CRC Severely Errored Seconds
	37- CRC ERR RT	CRC Error Rate
	40- RX FREQ,Hz	Received Frequency in Hertz
	44- SIG LOS SEC	Signal Loss Seconds
	54- ELAPSE TIME	Elapsed Time (starts with test restart)
	A/B/C/D	N/A

Table 4-4
Out-of-Service DS1 Testing from a DS3 Access Point
(Continued)

Step	Controls/Indicators/ Connectors	Instructions/ Comments
23.	305 **CATEGORY** switch	Select AUX position (LED illuminates).
24.	305 RESULT (SCROLL) switch	Scroll to MUX TX function. Select TONE ALL with 305 UP/DOWN switch.
25.	203 **DS0 CHANNEL SELECT** switch	Select desired DS0 channel (1-24).
26.	203 LEVEL meter/ CLIPPING LED	Observe selected channel signal for level and clipping.
27.	203 Speaker/VF output	Observe as required. Adjust speaker volume control. VF OUT jack available for additional VF testing.

4.4.2 DS1 Testing From a DS1 Access Point

In this procedure the T-BERD 203 transmits a DS1 framed test pattern over the network. The received DS1 signal is analyzed with the T-BERD 203. Figure 4-4 diagrams the connections required to test a DS1 signal from a DS1 DSX patch bay. Table 4-5 describes how to set up the T-BERD 305/203 to perform out-of-service testing of a DS1 signal from a DS1 access point. The following procedures are divided into three sections: T-BERD 305 set up, T-BERD 203 set up, and results accumulation and testing. Performing tests from a DS1 access point only disrupts the selected DS1 signal, not the entire DS3 signal. If testing the span in one direction does not indicate signal impairments, jack into the other side of the span to check the other direction and repeat the procedure.

4.4.3 Testing M13 Multiplexers

This procedure uses the T-BERD 305/203 to test the multiplexing and demultiplexing functions of an M13 multiplexer. The following procedures are divided into three sections: T-BERD 305 set up, T-BERD 203 set up, and results accumulation and testing.

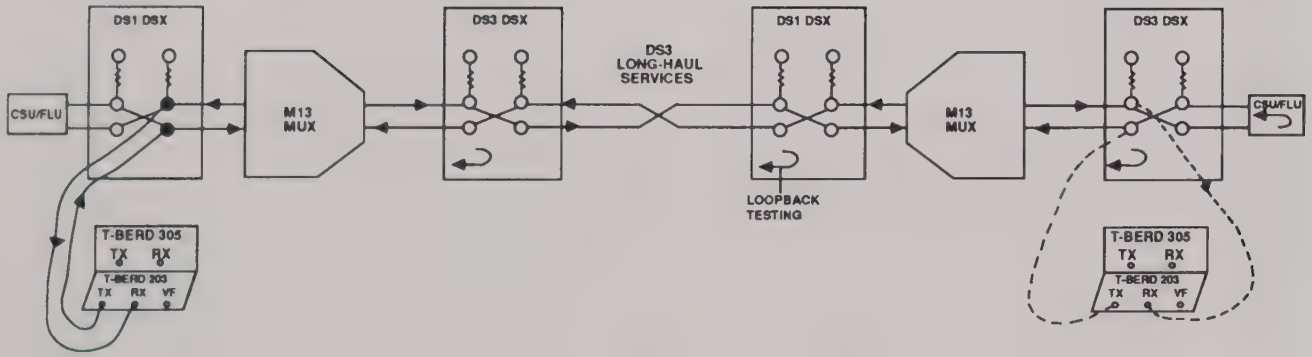

Figure 4-4
Out-of-Service DS1 Testing from a DS1 Access Point

Table 4-5
Out-of-Service DS1 Testing from a DS1 Access Point

Step	Controls/Indicators/ Connectors	Instructions/ Comments
1.	Remote End Set Up	Establish remote loopback using T-BERD 203 **LOOP CODES** switches or manually. For end-to-end test repeat procedure at remote end.
2.	Initial Instrument Set Up	Perform as required (see Table 4-1).
3.	a) Line Side Test Connections b) Equipment Side Test Connections	Go to Step 4. Go to Step 5.
4.	Line Side Testing	Testing span.
	a) 203 RECEIVE INPUT/ DS1 patch bay OUT jack	Connect WECO 310 plug cable between jacks. Note direction of signal being tested.
	b) 203 TRANSMIT OUTPUT/ DS1 patch bay IN jack	Connect WECO 310 plug cable between jacks. Note direction of signal being tested.
5.	Equipment Side Testing	Testing equipment (see Figure 4-4).
	a) 203 RECEIVE INPUT/ DS1 patch bay OUT jack	Connect WECO 310 plug cable between jacks. Note direction of signal being tested.
	b) 203 TRANSMIT OUTPUT/ DS1 patch bay IN jack	Connect WECO 310 plug cable between jacks. Note direction of signal being tested.
6.	203 **MODE** switch	Select framing mode.
	T1	Unframed T1.
	T1 D4	D4 superframe.
	T1 ESF	Extended Superframe.
	T1 ESFz	ESF with ZBTSI encoding.
	T1 SLC	Must be selected for SLC formatted DS1 signals.
	AUX	See Section 2.5.
7.	203 **PATTERN** switch	Select test pattern.
	ALL ONES	Fixed Mark only test pattern.

Table 4-5
Out-of-Service DS1 Testing from a DS1 Access Point
(Continued)

Step	Controls/Indicators/ Connectors	Instructions/ Comments
7. cont.	3 IN 24	Repeating fixed pattern (F0100 0100 0000 0000 0000 0100).
	QRSS	Quasi-Random Signal Source pattern (modified 2^{20}-1 pattern).
	2^20-1	1,048,575-bit pseudorandom pattern.
	2^23-1	8,388,607-bit pseudorandom pattern.
	PGM PAT	See Auxiliary PGM PAT, Section 2.5.1.
8.	203 **TIMING** switch	Select INTERNAL timing.
9.	**RESTART/HISTORY RESET** switch	Restart instrument clearing results and HISTORY LEDs.
10.	203 Receive Signal Status	Check Receive Signal LEDs.
	T1 PULSES	T1 signal detected.
	PATTERN SYNC	Pattern synchronization acquired.
	FRAME SYNC	Frame synchronization acquired.
	B8ZS	B8ZS encoding detected.
11.	203 Alarm	Check Alarms. LEDs should not illuminate. If illuminated, further analysis is required.
	SIGNAL LOSS	Loss of signal.
	PATTERN LOSS	Loss of pattern synchronization.
	FRAME LOSS	Loss of frame synchronization.
	EXCESS ZEROS	Excess zeros detected.
	YELLOW ALARM	Yellow alarm detected.
	ALL ONES	All ones detected.
	ERROR EVENT	Error event detected. Go to Step 12.
12.	203 **RESULTS** switches	Scroll through available DS1 results. N/A indicates result not applicable to set up. UNAVAILABLE indicates result applicable to set up but not calculated yet.
	00- BIT ERRORS	Bit Errors
	01- ASYN ER SEC	Asynchronous Errored Seconds
	04- BIT ERR RT	Bit Error Rate
	06- % EFS	Percentage of Error-Free Seconds

Table 4-5
Out-of-Service DS1 Testing from a DS1 Access Point
(Continued)

Step	Controls/Indicators/ Connectors	Instructions/ Comments
12. cont.	07- SYN ERR SEC	Synchronized Errored Seconds
	08- OUT SYN SEC	Out of Synchronization Seconds
	09- SLIPS	Pattern Slips
	10- SEV ERR SEC	Severely Errored Seconds
	16- CSES	Consecutive Severely Errored Seconds
	25- BPVs	Bipolar Violations
	26- BPV SEC	BPV Seconds
	27- BPV RATE	BPV Rate
	28- FRM ERR SEC	Frame Errored Seconds
	29- FRM SES	Framed Severely Errored Seconds
	30- FRM ERRORS	Frame Errors
	31- FRM ERR RT	Frame Error Rate
	32- CRC ERRORS	CRC Errors
	33- CRC ERR SEC	CRC Errored Seconds
	35- FRM LOS SEC	Frame Loss Seconds
	36- CRC SES	CRC Severely Errored Seconds
	37- CRC ERR RT	CRC Error Rate
	40- RX FREQ,Hz	Received Frequency in Hertz
	44- SIG LOS SEC	Signal Loss Seconds
	54- ELAPSE TIME	Elapsed Time (starts with test restart)
	A/B/C/D	N/A

Figure 4-5 diagrams the connections required to test the multiplexing functions of an M13 multiplexer. In Figure 4-5 the T-BERD 203 sends a DS1 test pattern through the M13 multiplexer DS1 input. The T-BERD 305 receives the multiplexed DS3 signal from the M13 multiplexer DS3 output.

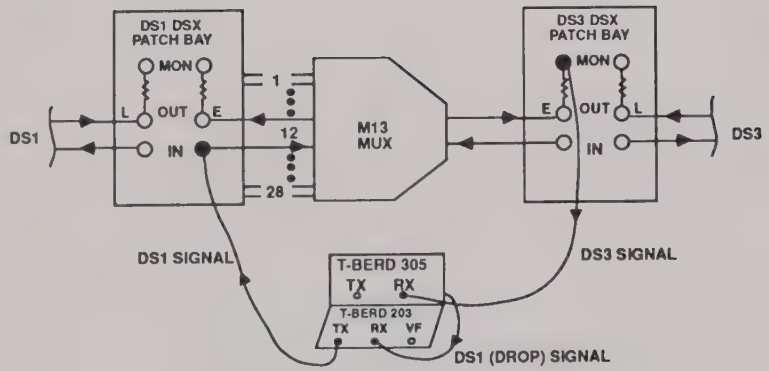

Figure 4-5
Testing the Multiplexing Functions of an M13 Multiplexer

The T-BERD 305 analyzes the signal and drops the selected DS1 signal which is sent to the T-BERD 203 for additional analysis. Table 4-6 describes how to set up the T-BERD 305/203 to test the multiplexing function of an M13 multiplexer. This procedure only disrupts the DS1 signal.

Figure 4-6 diagrams the connections required to test the demultiplexing functions of an M13 multiplexer. In Figure 4-6 the T-BERD 305 sends a demultiplexable DS3 test pattern through the M13 multiplexer DS3 input.

Table 4-6
Testing the Multiplexing Functions of an M13 Multiplexer

Step	Controls/Indicators/ Connectors	Instructions/ Comments
1.	Initial Instrument Set Up	Perform as required (see Table 4-1).
2.	305 **TIMING** switch	Select RECOVD (LOOP) timing (LED illuminates).
3.	305 **TEST** switch	Select desired test length: TIMED or CONTINUOUS.
4.	305 **RECEIVE INPUT** switch	Select DSX position (LED illuminates).
5.	305 RECEIVE INPUT/ DS3 patch bay OUT jack	Connect 440 plug cable between jacks (see Figure 4-5). Note direction of signal being tested.
6.	305 **CATEGORY** switch	Select AUX position (LED illuminates).
7.	305 **RESULT (SCROLL)** switch	Scroll through Auxiliary functions. Select applicable setting with 305 **UP/DOWN** switch.
	ERR INS RT	N/A.
	BURST DUR	N/A.
	ERR THR	1E-2 to 1E-9.
	FRAMING	M13 or C-BIT (match multiplexer requirements).
	XBIT	0, 1, or A (C-bit framing only).
	DS1 DROP	1 to 28 (select DS1 channel).
	ERR TYP	N/A.

Table 4-6
Testing the Multiplexing Functions of an M13 Multiplexer
(Continued)

Step	Controls/Indicators/ Connectors	Instructions/ Comments
7. cont.	04- BIT ERR RT	Bit Error Rate
	06- % EFS	Percentage of Error-Free Seconds
	07- SYN ERR SEC	Synchronized Errored Seconds
	08- OUT SYN SEC	Out of Synchronization Seconds
	09- SLIPS	Pattern Slips
	10- SEV ERR SEC	Severely Errored Seconds
	16- CSES	Consecutive Severely Errored Seconds
	25- BPVs	Bipolar Violations
	26- BPV SEC	BPV Seconds
	27- BPV RATE	BPV Rate
	28- FRM ERR SEC	Frame Errored Seconds
	29- FRM SES	Framed Severely Errored Seconds
	30- FRM ERRORS	Frame Errors
	31- FRM ERR RT	Frame Error Rate
	32- CRC ERRORS	CRC Errors
	33- CRC ERR SEC	CRC Errored Seconds
	35- FRM LOS SEC	Frame Loss Seconds
	36- CRC SES	CRC Severely Errored Seconds
	37- CRC ERR RT	CRC Error Rate
	40- RX FREQ,Hz	Received Frequency in Hertz
	44- SIG LOS SEC	Signal Loss Seconds
	54- ELAPSE TIME	Elapsed Time (starts with test restart)
	A/B/C/D	N/A
	EXT CLOCK	N/A.
	MUX TX	OFF.
	T1 FRAME TX	N/A.
8.	a) 203 RECEIVE INPUT/ 305 DS1 DROP OUTPUT jack	Connect WECO 310 plug cable between jacks (see Figure 4-5).
	b) 203 TRANSMIT OUTPUT/DS1 patch bay IN jack	Connect WECO 310 plug cable between jacks. Note direction of signal and DS1 signal being tested.
9.	203 **MODE** switch	Select framing mode.
	T1	Unframed T1.
	T1 D4	D4 superframe.
	T1 ESF	Extended Superframe.
	T1 ESFz	ESF with ZBTSI encoding.

Table 4-6
Testing the Multiplexing Functions of an M13 Multiplexer (Continued)

Step	Controls/Indicators/ Connectors	Instructions/ Comments
9. cont.	T1 SLC	Must be selected for SLC formatted DS1 signals.
	AUX	See Paragraph 2.5.
10.	203 **PATTERN** switch	Select ALL ONES, 3IN24, QRSS, 2^20-1, 2^20-1, or PGM PAT test pattern.
11.	203 **TIMING** switch	Select RECOVD (LOOP) timing (LED illuminates).
12.	**RESTART/HISTORY RESET** switches	Restart both instruments clearing results and HISTORY LEDs.
13.	305 STATUS	Check Receive Signal Status.
	SIGNAL PRES	DS3 Signal detected.
	PATTERN SYNC	N/A.
	FRAME SYNC	Frame synchronization acquired.
14.	305 ALARMS	Check Alarms. LEDs should not illuminate. If illuminated, further analysis is required.
	SIGNAL LOSS	Loss of signal.
	PATTERN LOSS	N/A.
	FRAME LOSS	Loss of frame synchronization.
	BLUE SIGNAL	Blue signal detected.
15.	305 **CATEGORY/RESULT** switches	Select category with **CATEGORY** switch. Scroll through selected category with **RESULT (SCROLL)** switch.
	LOGIC	N/A.
	BPV	BPV errors, rates, and seconds.
	PARITY	Parity, C-bit, and FEBE errors, rates, and seconds.
	FRAME	Frame errors, rates, seconds, FEOOF and NEOOF seconds.
	SIGNAL	Signal losses, clock frequencies, levels.
	TIME	Test times, time of day, and date.

Table 4-6
Testing the Multiplexing Functions of an M13 Multiplexer (Continued)

Step	Controls/Indicators/ Connectors	Instructions/ Comments
16.	203 Receive Signal Status	Check Receive Signal LEDs.
	T1 PULSES	T1 signal detected.
	PATTERN SYNC	Pattern synchronization acquired.
	FRAME SYNC	Frame synchronization acquired.
	B8ZS	N/A.
17.	203 Alarm	Check Alarms. LEDs should not illuminate. If illuminated, further analysis is required.
	SIGNAL LOSS	Loss of signal.
	PATTERN LOSS	Loss of pattern synchronization.
	FRAME LOSS	Loss of frame synchronization.
	EXCESS ZEROS	Excess zeros detected.
	YELLOW ALARM	Yellow alarm detected.
	ALL ONES	All ones detected.
	ERROR EVENT	Error event detected. Go to Step 18.
18.	203 **RESULTS** switches	Scroll through available DS1 results. N/A indicates result not applicable to set up. UNAVAILABLE indicates result applicable to set up but not calculated yet.
	00- BIT ERRORS	Bit Errors
	01- ASYN ER SEC	Asynchronous Errored Seconds

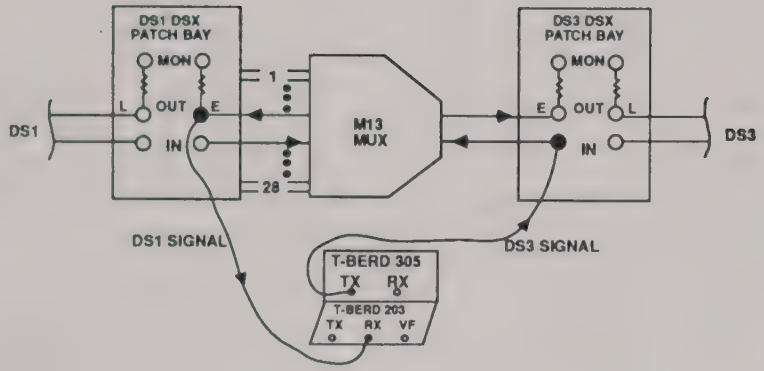

Figure 4-6
Testing the Demultiplexing Functions of an M13 Multiplexer

The T-BERD 203 receives the demultiplexed DS1 signal from the M13 multiplexer DS1 output and analyzes the signal. Table 4-7 describes how to set up the T-BERD 305/203 to test the demultiplexing function of an M13 multiplexer. This procedure disrupts the entire DS3 signal.

Table 4-7
Testing the Demultiplexing Functions of an M13 Multiplexer

Step	Controls/Indicators/ Connectors	Instructions/ Comments
1.	Initial Instrument Set Up	Perform as required (see Table 4-1).
2.	305 **TIMING** switch	Select INTERNAL timing.
3.	305 **TEST** switch	Select desired test length: TIMED or CONTINUOUS.
4.	305 **TRANSMIT OUTPUT** switch	Select DSX position (LED illuminates).
5.	305 TRANSMIT OUTPUT/ DS3 patch bay IN jack	Connect 440 plug cable between jacks (see Figure 4-6). Note direction of signal being tested.
6.	305 **CATEGORY** switch	Select AUX position (LED illuminates).
7.	305 **RESULT (SCROLL)** switch	Scroll through Auxiliary functions. Select applicable setting with 305 **UP/DOWN** switch.
	ERR INS RT	1E-2 to 1E-9.
	BURST DUR	25 ms to 5 s.
	ERR THR	1E-2 to 1E-9.
	FRAMING	M13 or C-BIT (match multiplexer requirements).
	XBIT	0, 1, or A (C-bit framing only).
	DS1 DROP	1 to 28 (select DS1 channel).
	ERR TYP	LOGIC, BPV, or BOTH.
	EXT CLOCK	N/A.
	MUX TX	QRSSn (n=1-28, select DS1 channel), QRSS ALL, or 3-24 ALL.
	T1 FRAME TX	D4 or ESF (match 203 framing mode).

Table 4-7
Testing the Demultiplexing Functions of an M13 Multiplexer (Continued)

Step	Controls/Indicators/ Connectors	Instructions/ Comments
8.	203 RECEIVE INPUT/ DS1 patch bay OUT jack	Connect WECO 310 plug cable between jacks (see Figure 4-6). Note direction of signal and DS1 signal being tested.
9.	203 **MODE** switch	Select framing mode.
	T1	Unframed T1.
	T1 D4	D4 superframe.
	T1 ESF	Extended Superframe.
	T1 ESFz	ESF with ZBTSI encoding.
	T1 SLC	Must be selected for SLC formatted DS1 signals.
	AUX	See Section 2.5.
10.	203 **PATTERN** switch	Select QRSS or 3IN24 test pattern matching 305 MUX TX test pattern (see Step 7).
11.	203 **TIMING** switch	Select RECOVD (LOOP) timing (LED illuminates).
12.	**RESTART/HISTORY RESET** switches	Restart both instruments clearing results and HISTORY LEDs.
13.	203 Receive Signal Status	Check Receive Signal LEDs.
	T1 PULSES	T1 signal detected.
	PATTERN SYNC	Pattern synchronization acquired.
	FRAME SYNC	Frame synchronization acquired.
	B8ZS	B8ZS encoding detected.
14.	203 Alarm	Check Alarms. LEDs should not illuminate. If illuminated, further analysis is required.
	SIGNAL LOSS	Loss of signal.
	PATTERN LOSS	Loss of pattern synchronization.
	FRAME LOSS	Loss of frame synchronization.
	EXCESS ZEROS	Excess zeros detected.
	YELLOW ALARM	Yellow alarm detected.
	ALL ONES	All ones detected.
	ERROR EVENT	Error event detected. Go to Step 15.

Table 4-7
Testing the Demultiplexing Functions of an M13 Multiplexer
(Continued)

Step	Controls/Indicators/ Connectors	Instructions/ Comments
15.	203 **RESULTS** switches	Scroll through available DS1 results. N/A indicates result not applicable to set up. UNAVAILABLE indicates result applicable to set up but not calculated yet.
	00- BIT ERRORS	Bit Errors
	01- ASYN ER SEC	Asynchronous Errored Seconds
	04- BIT ERR RT	Bit Error Rate
	06- % EFS	Percentage of Error-Free Seconds
	07- SYN ERR SEC	Synchronized Errored Seconds
	08- OUT SYN SEC	Out of Synchronization Seconds
	09- SLIPS	Pattern Slips
	10- SEV ERR SEC	Severely Errored Seconds
	16- CSES	Consecutive Severely Errored Seconds
	25- BPVs	Bipolar Violations
	26- BPV SEC	BPV Seconds
	27- BPV RATE	BPV Rate
	28- FRM ERR SEC	Frame Errored Seconds
	29- FRM SES	Framed Severely Errored Seconds
	30- FRM ERRORS	Frame Errors
	31- FRM ERR RT	Frame Error Rate
	32- CRC ERRORS	CRC Errors
	33- CRC ERR SEC	CRC Errored Seconds
	35- FRM LOS SEC	Frame Loss Seconds
	36- CRC SES	CRC Severely Errored Seconds
	37- CRC ERR RT	CRC Error Rate
	40- RX FREQ, Hz	Received Frequency in Hertz
	44- SIG LOS SEC	Signal Loss Seconds
	54- ELAPSE TIME	Elapsed Time (starts with test restart)
	A/B/C/D	N/A

PRINTER OPERATION

5.1 INTRODUCTION

The T-BERD 203 can generate printouts of test results, front panel configurations, and status and alarm messages through the PRINTER/REMOTE CONTROL interface to an RS-232-C serial printer. This section describes the interface set-up and operation, and the different types of printouts generated by the T-BERD 203. Refer to the T-BERD 305 Operating Manual, Section 5, Printer/Remote Control Interfaces, for additional information on T-BERD 305 printer operation. The T-BERD 305/203 is designed to operate with the TTC PR-40A dot matrix printer, however most commercially available printers with RS-232-C serial ports can also be used.

NOTE: To generate printouts from the T-BERD 203, the T-BERD 305 must have the Remote Control Option (305-4) installed.

5.2 INTERFACE REQUIREMENTS

The interface is configured as DCE which allows most RS-232-C compatible serial printers to operate from it. The interface printer output is controlled through the T-BERD 305 DIP switches which are described in Table 5-1. Refer to Section 2.4.3 for a description of the T-BERD 203 PRINTER/REMOTE CONTROL interface operation and pin assignments.

The baud rate and parity settings can also be controlled through the T-BERD 203 Auxiliary BAUD and PARITY functions (see Sections 2.4.6 and 2.4.7). At power-up, both functions are defaulted to the T-BERD 305 DIP switch settings. Once power has been applied and the communications link between the T-BERD 203 and T-BERD 305 is established (through the extension cable), the T-BERD 203 Auxiliary BAUD and PARITY functions can be used to reconfigure the baud rate and parity for the interface instead of resetting the DIP switches. However, if the T-BERD 305/203 is turned off and on, the Auxiliary BAUD and PARITY functions default back to the DIP switch settings. It is recommended that either the DIP switches be set to match the printer configuration or set the printer to match the interface.

Table 5-1
T-BERD 305 Interface Control DIP Switches

Switch	Function	Selections
1/2	Baud rate	300, 1200, 2400, or 4800 baud (default, 2400).
3	Parity	Odd or Even (default, Even).
4	Line terminator	Carriage return (CR) or Carriage return/Line-feed (CRLF) (default, CR).
5	Printout width	20-column or 80-column (default, 80-column).
6	Print speed	Fast or Slow (default, Fast).
7	Data bits	7 or 8 (default, 7).
All defaults are in the UP position.		

5.3 T-BERD 203 PRINTOUTS

The T-BERD 203 printouts are controlled by the T-BERD 203 **PRINT** and T-BERD 305 **AUTO PRINT EVENT** switches. The T-BERD 203 **PRINT** switch has two momentary positions, labeled RESULTS and CONTROLS. The T-BERD 305 **AUTO PRINT EVENT** switch controls automatic RESULTS printouts for both instruments.

All printouts are generated in a 20- or 80-column format. The printout format is controlled through the T-BERD 305 PRINT OUT WIDTH DIP switch (SW 5). The default is 80-column. When using the TTC PR-40A dot matrix printer, the 80-column format is automatically printed in a 40-column format to fit the printer paper size. The 20-column format generates a 20-column printout.

5.3.1 RESULTS Printouts

The results listed in the T-BERD 203 RESULTS printout are determined by the position of the **MODE** switch. Table 5-2 lists the available results printed out for each operating mode. The RESULTS printout also list, under

Table 5-2
Operating Mode Results

T1 (Unframed)	T1 D4	T1 ESF	T1 ESFz	T1 SLC
BIT ERRORS	BIT ERRORS	BIT ERRORS	BIT ERRORS	BIT ERRORS
ASYN ER SEC	ASYN ER SEC	ASYN ER SEC	ASYN ER SEC	ASYN ER SEC
BIT ERR RT	BIT ERR RT	BIT ERR RT	BIT ERR RT	BIT ERR RT
% EFS	% EFS	% EFS	% EFS	% EFS
SYN ERR SEC	SYN ERR SEC	SYN ERR SEC	SYN ERR SEC	SYN ERR SEC
OUT SYN SEC	OUT SYN SEC	OUT SYN SEC	OUT SYN SEC	OUT SYN SEC
SLIPS	SLIPS	SLIPS	SLIPS	SLIPS
SEV ERR SEC	SEV ERR SEC	SEV ERR SEC	SEV ERR SEC	SEV ERR SEC
CSES	CSES	CSES	CSES	CSES
BPVs	BPVs	BPVs	BPVs	BPVs
BPV SEC	BPV SEC	BPV SEC	BPV SEC	BPV SEC
BPV RATE	BPV RATE	BPV RATE	BPV RATE	BPV RATE
RX FREQ, Hz	FRM ERR SEC	CRC ERRORS	CRC ERRORS	FRM ERR SEC
SIG LOS SEC	FRM SES	CRC ERR SEC	CRC ERR SEC	FRM SES
ELAPSE TIME	FRM ERRORS	FRM LOS SEC	FRM LOS SEC	FRM ERRORS
	FRM ERR RT	CRC SES	CRC SES	FRM ERR RT
	FRM LOS SEC	CRC ERR RT	CRC ERR RT	FRM LOS SEC
	RX FREQ, Hz	RX FREQ, Hz	RX FREQ, Hz	RX FREQ, Hz
	SIG LOS SEC	SIG LOS SEC	SIG LOS SEC	SIG LOS SEC
	ELAPSE TIME	ELAPSE TIME	ELAPSE TIME	ELAPSE TIME
	A:/B:	A:/B:	A:/B:	A:/B:
		C:/D:	C:/D:	

the heading 203 ALARM STATUS, any alarm or status LEDs that are illuminated at the time the printout is generated. Figure 5-1 is an example of a T1 SLC-96 framed mode RESULTS printout.

NOTE: When a RESULTS printout is generated and the results have not been computed, the message "UNAVAIL" is printed in place of the result measurement. This can occur when the T-BERD 305/203 has not achieved initial frame or pattern synchronization and a result was specified that is only available after the T-BERD 305/203 has achieved initial synchronization.

```
  203 RESULTS PRINT     21:56:34 31 MAR 88
BIT ERR             0   ASY E SEC           0
BER           0.0E-08   % EFS          100.00%
SY ER SEC           0   OUT S SEC           0
SLIPS               0   SES                 0
CSES                0   BPVs                0
BPV SEC             0   BPV RT        0.0E-08
FRM E SEC           0   FRM SES             0
FRM ERR             0   FRM E RT      0.0E-08
F L SEC             0   RX FREQ Hz    1544000
SIG L SEC           0   ELA TM        0:25:35
  203 ALARM STATUS
T1 PULSES          ON   PATTERN SYNC       ON
FRAME SYNC         ON   B8ZS               OFF
SIGNAL LOSS       OFF   PATTERN LOSS      OFF
FRAME LOSS HIS     ON   EXCESS ZEROS HIS   ON
YEL ALARM HIS      ON   ALL ONES           ON
ALL ONES HIS       ON   ERR EVENT HIS      ON
  203 SIGNAL STATUS
A:      100101 010100   101001 100101
B:      100101 010100   101001 100101
```

Figure 5-1
T1 SLC Framed Mode Results Printout

A T-BERD 203 RESULTS printout is generated from one of the following situations:

(1) Pressing the T-BERD 203 **PRINT** switch RESULTS position.

(2) The execution of one of the automatic T-BERD 305 print events selected with the **AUTO PRINT EVENT** switch. The automatic print event printouts provide a combined T-BERD 203 and T-BERD 305 RESULTS printout. All printouts have a header that identifies the type of print event selected and the time of day. The switch provides the following print event functions:

(a) OFF — This position disables the automatic printouts and clears the T-BERD 305/203 printer buffer. Separate RESULTS and CONTROLS printouts are still available through the manual **PRINT** switches on each instrument.

(b) 15 MIN — This position generates a RESULTS printout every 15 minutes.

(c) 30 MIN — This position generates a RESULTS printout every 30 minutes.

(d) 2 HR — This position generates a RESULTS printout every 2 hours.

(e) ERR SEC — This position generates a RESULTS printout for each errored second detected. An errored second print is generated on the occurrence of DS1 or DS3 logic errors, CRC errors, frame errors, or BPVs.

(f) TEST END — This position generates a RESULTS printout at the end of a T-BERD 305 timed test.

(3) A result counter overflow condition occurs. Each time a result counter overflows, the overflowed result is preceded by a double asterisk (**) on the printout. This indicates the result just now overflowed in the last second. Subsequent printouts of the overflowed result are preceded by a single asterisk (*) to indicate a previously overflowed result. All asterisks are cleared at test restart. A RESULTS printout with overflowed results is labeled OVERFLOW PRINT.

(4) If the T-BERD 305 ERR SEC print event is selected and an errored second has not occurred in the past 6 hours, a 6-hour backup RESULTS printout is generated. The printout is labeled BACKUP PRINT.

5.3.2 Controls Printout

The CONTROLS printout lists the current position of all of the T-BERD 203 front panel switches and Auxiliary function settings. A T-BERD 203 CONTROLS printout is generated by pressing the **PRINT** switch to the CONTROLS position. Figure 5-2 is an example of a CONTROLS printout.

```
203 CONTROLS PRINT     21:56:34 31 MAR 88
MODE:            T1 D4  PATTERN:          QRSS
DISPLAY HOLD:      OFF  ERR INS:           OFF
TIMING:            INT  LOOP UP:           OFF
LOOP DOWN:         OFF  BAUD RATE:        2400
PARITY:            ODD  LP FRM:       OVERWRITE
CHAN  SEL:          24  DATA SEL:      DATALINK
LP CODE:           CSU  PGM LPUP:         10000
PGM LPDN:          100  PGM PAT:    1010010101
```

Figure 5-2
Controls Printout

5.3.3 Alarm and Status Messages

When the T-BERD 305 **AUTO PRINT EVENT** switch is not set to OFF, T-BERD 203 alarm or status messages are generated when a specific condition occurs during a test. When any alarm or status condition changes, a single alarm or status message is printed out. This is true for all alarm conditions except PATTERN LOSS, YELLOW ALARM, EXCESS ZEROS, and ALL ONES. With these four conditions, their status is checked at the end of each second and if the status of any have changed, a single alarm message is printed for each. The alarm or status message is printed along with the date and time. An alarm message would be printed as:

```
203 T1 SIG LOSS 001 16:45:50 07 APR 88
```

Alarm and status messages are categorized as follows:

(1) **203 ALL ONES, 203 EX ZERO —** These alarm messages are followed by either ON or OFF to indicate their status. EX ZERO (Excess Zero) alarm messages are not printed with the 2^{20}-1 or 2^{23}-1 pattern selected, due to the frequency of zeros in the pattern.

(2) **203 T1 PAT LOSS, 203 T1 FRM LOSS, 203 T1 SIG LOSS —** These alarm messages are followed by a count of the number of occurrences during the test.

(3) **203 T1 PAT SYNC, 203 T1 FRM SYNC —** These status messages are printed when synchronization is acquired.

(4) **203 TEST RESTART —** This status message is generated by pressing the **RESTART** switch or any of the other major switches.

(5) **203 NEW CONFIGUR —** This status message indicates a major switch has been changed. The major switches include: **MODE**, **PATTERN**, **RESTART**, and **TIMING**.

(6) **203 T1 SIG DETECT —** This status message indicates the T1 signal has been detected.

Refer to the T-BERD 305 Operating Manual for alarm and status messages generated by the T-BERD 305.

REMOTE CONTROL OPERATION

6.1 INTRODUCTION

This section describes the T-BERD 203 commands and errors messages used to control the T-BERD 203 from a remote device. The T-BERD 305 must have the Remote Control Option (305-4) installed before the T-BERD 305/203 can be used in a remote control set up. Refer to the T-BERD 305 Operating Manual for T-BERD 305 remote control commands and T-BERD 305/203 remote control operation.

The T-BERD 203 commands are divided into three categories: front panel switch commands, Auxiliary function commands, and remote control only commands. All T-BERD 203 commands are preceded with an "@" character. The commands are listed alphabetically by category in Table 6-1. The T-BERD 203 commands are described in alphabetical order in Appendix A. Each command is explained, references to associated commands are given, and an example of the command usage is given. Refer to the T-BERD 305 Operating Manual for T-BERD 305 remote control commands.

Table 6-1
T-BERD 203 Remote Control Commands

Front Panel Switch Commands		
Switch Name	**Command**	**Command Name**
DISPLAY HOLD	@DIS HOL [ ][1, 2]	Display Hold Control
DS0 CHANNEL SELECT	@CHA SEL [ ]	Select DS0 Channel
ERROR INSERT	@ERR INS [ ][2]	Insert Logic Errors
HISTORY RESET	@HIS RES[2]	Reset History LEDs

[1] The brackets indicate additional parameters are provided with command. A command sent without a parameter prints the current setting of the command.

[2] These commands have equivalent T-BERD 305 commands.

Table 6-1
T-BERD 203 Remote Control Commands (Continued)

Front Panel Switch Commands		
Switch Name	**Command**	**Command Name**
LOOP DOWN	@LOO DOW [ ]	Generate Loop-Down Code
LOOP UP	@LOO UP [ ]	Generate Loop-Up Code
MODE	@MOD [ ]	Select Operating Mode Format
PATTERN	@PAT [ ][2]	Generate Data Pattern
PRINT	@PRI [ ][2]	Initiate CONTROLS/RESULTS Printout
PRINT CONTROLS	@CONTROLS[2]	Initiate CONTROLS Printout
PRINT RESULTS	@RESULTS[2]	Initiate RESULTS Printout
RESTART	@RESTART[2]	Restart Test
RESULTS I	@RES 1 [ ][2]	Display Analysis Results in the RE SULTS I display
RESULTS II	@RES 2 [ ][2]	Display Analysis Results in the RESULTS II display
TIMING	@TIM [ ][2]	Select Timing Mode
Auxiliary Function Commands		
AUX Name	**Command**	**Command Name**
BAUD	@BAUD[2]	Print PRINTER/REMOTE CONTROL Baud Rate
DATA PORT	@DAT POR SEL [ ]	Select Data Port Output
LP CODE	@LOO COD [ ]	Select Auxiliary Loop Code
LP FRM	@LP FRM [ ]	Loop-Code Framing Control
PARITY	@PARITY[2]	Print PRINTER/REMOTE CONTROL Parity
PGM LPDN	@PGM LPDN [ ]	Program Loop-Down Code
PGM LPUP	@PGM LPUP [ ]	Program Loop-Up Code
PGM PAT	@PGM PAT [ ]	Program Data Bit Pattern

Table 6-1
T-BERD 203 Remote Control Commands (Continued)

Remote Control Only Commands	
Command	**Command Name**
@ALARM [ ][2]	Alarm Message Printout Control
@DISPLAY [ ][2]	Front Panel Display Control
@HELP[2]	On-Line Help Function
@LEDS[2]	Print Front Panel LED Status
@PRINT [ ][2]	Print Single T-BERD 203 Result Value

[2] These commands have equivalent T-BERD 305 commands.

6.2 ERROR MESSAGES

A command entered without the @ character can be interpreted as a T-BERD 305 command or as invalid. If an invalid command is entered, the T-BERD 305/203 sends an error message indicating the error. The following T-BERD 203 error messages are supplied in addition to the T-BERD 305 error messages listed in the T-BERD 305 Operating Manual.

ERROR: *Invalid programmable bit pattern.* — The bit pattern entered contained a non-zero or non-one bit value.

ERROR: *Defined programmable bit pattern too long.* — The length of the bit pattern entered for PGM PAT exceeded 24 bits, or for PGM LPDN or PGM LPUP exceeded 8 bits.

ERROR: *Defined programmable bit pattern too short.* — Length of programmable bit pattern entered was less than the minimum three bits.

When the remote mode is activated (enter valid command), both the T-BERD 203 and the T-BERD 305 are placed under remote control; one cannot be in remote mode without the other. The same applies to exiting remote mode. The front panel switches are disabled except for the T-BERD 203 **RESULTS** switches and the T-BERD 305 **CATEGORY** and **RESULTS** switches.

Refer to the T-BERD 305 Operating Manual for instructions on entering and exiting remote mode operation. It should be noted that the T-BERD 305 Auto-baud feature is not available through the T-BERD 203 PRINTER/REMOTE CONTROL interface.

MAINTENANCE AND SERVICE

7.1 INTRODUCTION

This section contains information on maintenance and service for the T-BERD 203 DS1/DS0 Analyzer. Specifically, it includes steps to take should the user experience difficulty operating the T-BERD 203 and a description of TTC's warranty and repair procedures.

7.2 MAINTENANCE

7.2.1 In Case Of Difficulty

If the T-BERD 203 DS1/DS0 Analyzer fails to operate and no front panel indicators are illuminated, check that the front panel of the T-BERD 305 DS3 Analyzer is illuminated. If the T-BERD 305 is not operating, check that the AC power cord is securely connected to the T-BERD 305 and that the power supply is uninterrupted, or refer to the T-BERD 305 Operating Manual. Also verify that a proper, working AC line fuse is installed. Information on the type of fuse and its installation is given in the T-BERD 305 Operating Manual.

If the T-BERD 305 DS3 Analyzer AC power cord, power supply, and fuse are found to be in proper working order, but the T-BERD 203 fails to operate, make sure the RS-232 connector on the coiled cable attached to the T-BERD 203 is securely fastened to the RS-232 connector receptacle on the rear panel of the T-BERD 305. If the instrument still fails to operate properly, contact the TTC Customer Service Department.

If the front panel indicators on T-BERD 203 are illuminated, but the instrument does not appear to operate properly, use the Instrument Checkout procedures in Section 3 as an aid in localizing the problem. If the T-BERD 203 still cannot be made to operate properly, note those areas in which the instrument is inoperable and contact TTC for assistance.

7.3 SERVICE

7.3.1 Warranty

All equipment manufactured by Telecommunications Techniques Corporation (TTC) is warranted against defects in material and workmanship. This

warranty applies only to the original purchaser and is non-transferable unless express written authorization of the warranty transfer is granted by TTC.

The T-BERD 203 will be repaired or replaced (at our option) at no charge for a period of three (3) years for the mainframe and one (1) year for any options after original receipt by the customer. Liability under this warranty extends only to the replacement value of the equipment. The warranty is void under the following conditions:

(1) Equipment has been altered or repaired without specific authorization from TTC.

(2) Equipment is installed or operated other than in accordance with instructions contained in TTC literature and operating manuals.

No other warranty is expressed or implied. TTC is not liable for consequential damages.

7.3.2 In-Warranty Service

Equipment in warranty must be returned to the factory with shipping prepaid. The equipment should be packed and shipped in accordance with instructions in Section 7.3.4 of this manual. Before returning any equipment, the customer must obtain a Return Authorization (RA) number by contacting the TTC Customer Service Department. The RA number should then appear on all paperwork and be clearly marked on the outside of the equipment container.

After the equipment is repaired by TTC, it will be tested to applicable specifications, burned-in for at least 24 hours, retested, and returned to the customer with shipping prepaid. A brief description of the work performed and the materials used will be provided on the Equipment Repair Report furnished with the returned equipment.

7.3.3 Out-Of-Warranty Service

The procedure for repairing out-of-warranty equipment is the same as that used for equipment still in warranty. However, there is a minimum charge applied to each request for out-of-warranty service. The minimum charge guarantees the customer an estimate of the repair costs and is used as credit

against actual materials and labor costs should the equipment be repaired. Contact the TTC Repair Department for specific information on the minimum out-of-warranty repair charge.

The customer will be billed for parts plus standard labor rates in effect at the time of repair. The customer will also be required to furnish a purchase order number before repair work can be started, and a hard copy of the purchase order must be received by TTC before the repaired equipment may be shipped to the customer. A description of the labor and materials used will be provided in the Equipment Repair Report.

Once an out-of-warranty repair is made, the repaired part or component is warranted for 90 days. This warranty applies only to the part or component that was repaired; other parts or components are not covered under the 90-day repair warranty.

7.3.4 Equipment Return Instructions

To all equipment returned for repair, the customer should attach a tag that includes the following information:

(1) Owner's name and address.

(2) A list of the equipment being returned and the applicable serial number(s).

(3) A detailed description of the problem or service requested.

(4) The name and telephone number of the person to contact regarding questions about the repair.

(5) The Return Authorization (RA) number.

If possible, the customer should return the equipment using the original shipping container and material. If the original container is not available, the unit should be carefully packed so that it will not be damaged in transit. TTC is not liable for any damage that may occur during shipping. The customer should clearly mark the TTC-issued RA number on the outside of the package and ship it prepaid and insured to TTC.

SPECIFICATIONS

8.1 INTRODUCTION

This section contains the specifications for the T-BERD 203 DS1/DS0 Analyzer.

8.2 GENERAL SPECIFICATIONS

8.2.1 Physical

- Size: 6.0"H x 13.5"W x 2.0" D (15.2 cm x 34.3 cm x 5.1 cm).
- Weight: 3.7 pounds (1.7 kg).

8.2.2 Operational

- Operating Temperature Range: 32°F to 104°F (0°C to 40°C).
- Storage Temperature Range: -4°F to 158°F (-20°C to 70°C).
- Power: Provided by T-BERD 305 through extension cable.

8.2.3 Input Specifications

- Connector: WECO 310 jack.
- Frequency: 1,544,000 Hz ±1000 Hz.
- Impedance: DSX-MON — 100 ohms ±5%.
- Operating Range: +6 to -5 dBdsx cable loss.
  +6 to -24dBdsx resistive loss.
- Line Code: AMI, B8ZS, or ZBTSI (optional).
- Jitter Tolerance: per AT&T PUB62411, 1985.

8.2.4 Output Specifications

- Connector: WECO 310 jack.
- Signal Level: 3V base-to-peak into a 100-ohm load.
- Pulse Shape: With output terminated into a 100-ohm resistive load, the T-BERD 203 meets pulse shape specifications given in CCITT Recommendation G.703; Bell Publications CB113, CB119, CB132, CB143, and AT&T PUB62508; and AT&T PUB62411.
- Internal Oscillator Accuracy: ±5 ppm.
- Line Code: AMI, B8ZS, or ZBTSI (optional).

8.2.5 T1 Framing Specifications

- D4 Superframe
- ESF
- ESFz
- SLC

8.3 FRONT PANEL

8.3.1 Switches

- Modes: T1 (unframed), T1 D4, T1 ESF, T1 ESFz (optional), T1 SLC, and AUX.
- Patterns: ALL ONES, 3 IN 24, PGM PAT (3- to 24-bit user-programmable), QRSS, 2^{20}-1, 2^{23}-1.
- Results: Bit Errors, Asynchronous Errored Seconds, Bit Error Rate, Percentage of Error-Free Seconds, Synchronized Errored Seconds, Out of Synchronization Seconds, Pattern Slips, Severely Errored Seconds, Consecutive Severely Errored Seconds, Bipolar Violations, BPV Seconds, BPV Rate, Frame Errored Seconds, Framed Severely Errored Seconds, Frame Errors, Frame Error Rate, CRC Errors, CRC Errored Seconds,

Frame Loss Seconds, CRC Severely Errored Seconds, CRC Error Rate, Received Frequency (Hz), Signal Loss Seconds, Elapsed Time, T1 Channel Signaling Status (ABCD).

- Restart: Clears results and restarts test.
- Display Hold: Freezes results during test.
- History Reset: Clears History LEDs.
- Logic Error Insert: Single or constant 10^{-3} rate in all operating modes.
- Transmit Timing: Internal or Recovered (loop).
- Loop Codes: Send loop-up code or loop-down code (codes selectable from AUX functions).
- DS0 Channel Select: Select DS0 channel.
- Volume control: Adjusts speaker output.
- Print: Results or Controls printouts.

8.3.2 Indicators

- Display Hold: (internal to switch).
- Alarm Status LEDs: Signal Loss, Signal Loss History, Pattern Loss, Pattern Loss History, Frame Loss, Frame Loss History, Excess Zeros, Excess Zeros History, Yellow Alarm, Yellow Alarm History, All Ones, All Ones History, and Error Event, Error Event History.
- Received Signal Status LEDs: T1 Pulses, Pattern Sync, Frame Sync, and B8ZS.
- Loop Code LEDs: Loop Up Send and Loop Down Send (internal to switch).
- Error Insert LED: 10^{-3} Logic Error Rate Insert (internal to switch).
- Timing LEDs: Internal or Recovered and no recovered clock detected (internal to switch).
- Level LED: 20-segment sliding digital VU meter, -54 to +3 dBm in 3 dB steps.

- Clipping LED: Received signal exceeds +3 dBm.
- Data Bits LEDs: Eight LEDs indicate selected DS0 channel data.
- Signaling Bits LEDs: Four LEDs indicate D4, ESF, and SLC signaling status.
- DS0 Channel Select LEDs: Two 7-segment LEDs indicate selected DS0 channel number.

8.3.3 Alarm Criteria

- Signal Loss: 150 ms without input pulses after initial signal detected.
- Pattern Sync Loss: QRSS, 2^{20}-1, and 2^{23}-1 — 250 errors in 1000 or fewer bits.
  ALL ONES, 3IN24, and PGM PAT — 100 errors in 1000 or fewer bits.
- Frame Sync Loss: D4 and SLC — two out of five F_t bits in error.
  ESF — two out of five frame bits in error.
- Excess Zeros: 16 or more consecutive zeros.
- Yellow Alarm: D4 and SLC — Bit 2 is a "0" for 255 consecutive channels.
  ESF — 256 bits $\pm$16 bits of repetitive
  11111111 00000000 pattern received in the data link.
- All Ones: Unframed — 2048 or more consecutive ones.

8.4 TEST PATTERN SPECIFICATIONS

8.4.1 Definitions

- ALL ONES: All Marks.
- 3 IN 24: F0100 0100 0000 0000 0000 0100. Pattern synchronized to framing bits to prevent D4 yellow alarms or excess zeros.

- QRSS: Quasi-Random Signal Source. Modified 2^{20}-1 pseudorandom pattern generates a maximum of 14 sequential zeros and 20 sequential ones.

- 2^{20}-1: 1,048,575-bit pseudorandom pattern generates a maximum of 19 sequential zeros and 20 sequential ones.

- 2^{23}-1: 8,388,607-bit pseudorandom pattern generates a maximum of 22 sequential zeros and 23 sequential ones.

- PGM PAT: User-defined 3- to 24-bit repeating pattern; factory setting is 10000. To force first pattern bit to follow framing bit, use pattern lengths of 3, 4, 6, 8, 12, 16 or 24 bits.

8.4.2 Pattern Sync Detection Criteria

- Fixed: 30 consecutive error-free bits.

- Pseudorandom: 30 + n consecutive error-free bits for a pattern length of 2^n-1 (QRSS, n = 20).

8.5 LOOP CODES

8.5.1 Patterns

- Format Generation: Unframed or framed. In framed mode, the pattern is either embedded between the framing bits or overwritten by the framing bits (selectable from AUX functions).

- Loop-Up Codes (selectable from AUX functions):
  CSU — 10000.
  FAC 1 — 1100.
  FAC 2 — 11000.
  PGM PAT — 3- to 8-bit continuous pattern (default 10000).

- Loop-Down Codes (selectable from AUX functions):
  CSU — 100.

FAC 1 — 1110.
FAC 2 — 11100.
PGM PAT — 3- to 8-bit continuous pattern (default 100).

8.5.2 Loop-Code Detection Criteria

- Loop Up: Continuously transmitted until the code is received error free for 250 ms or the switch is pressed a second time.
- Loop Down: Continuously transmitted until the code is no longer received or the switch is pressed a second time.

8.6 MEASUREMENT

8.6.1 DS1 Frequency

- Accuracy: ±5 ppm.
- Resolution: 1 Hz.
- T1 Range: 1,544,000 Hz ±1000 Hz.

8.6.2 DS0 Level

- Range: -54 to +3 dBm.
- Accuracy: 3 dB steps.

8.7 CONNECTORS

- Transmit Output: WECO 310 jack.
- Receive Input: WECO 310 jack.
- Voice Frequency Output: WECO 310 jack.
- Printer/Remote Control: 25-position, 7-pin, female D connector.
- Data Port: 25-position, 6-pin, female D connector.

- Extension cable: Coiled cable with 25-position, 11-pin, male D connector.

8.8 PRINTER/REMOTE CONTROL INTERFACE

- Configuration: Asynchronous DCE.
- Pin Assignments and signaling: See Table 2-1.
- Character Format: Data bits — 7-bit ASCII or 8-bit character (automatically set when selecting parity).
  Parity — even, odd, or none (selected from AUX functions).
  Start bits — two transmitted, two received.
  Stop bits — two transmitted, one or more received.
- Baud Rates: 300, 1200, 2400, and 4800 baud (selected from AUX functions).
- Line Terminator: CR or CRLF (selected from T-BERD 305).
- Printout Width: 20- and 80-column (selected from T-BERD 305).

8.9 DATA PORT INTERFACE

- Configuration: Synchronous DCE (transmit only).
- Pin Assignments and signaling: See Table 2-2.
- Data Format: DS0 or Data link (selected from AUX functions).
- Data Output: DS0 — 64 kb/s clear channel.
  ESF — 4 kb/s data link
  ESFz — 2 kb/s data link
  SLC — 4 kb/s data link and F_s bits (external decoding required).
- Timing: Recovered clock from received data on RECEIVE INPUT jack. Attached test set must synchronize to clock source on Pin 15. Output squelched until instrument is synchronized with framing bits.

8.10 VF OUTPUT

- Speaker: AGC stabilized with volume control.

- Jack: Impedance — 600 ohms resistive.
  Level — calibrated to dBm0 = 0 dBm.

8.11 GROUNDING

- Safety ground: T-BERD 305 AC power cord and grounding lug.

- Chassis ground: Pin 1 on extension cable, Printer/Remote Control interface, and Data Port interface.

- Signal ground: Pin 7 on extension cable, Printer/Remote Control interface, and Data Port interface.

T-BERD 203 Remote Control Commands

The T-BERD 203 remote control commands are listed in alphabetical order. Each command description contains the command syntax, parameters (if any), explanation, and example. Refer to the T-BERD 305 Operating Manual when T-BERD 305 remote control commands are mentioned.

Alarm Message Printout Control

@ALARM : Print the Alarm Message command status
@ALARM [ON/OFF] : Enable or disable Alarm Message printouts

The command sets or prints the current Alarm Message printout command status. It allows the user to enable or disable the printout of Alarm Messages. When **@ALARM ON** is selected, Alarm Messages are printed. When **@ALARM OFF** is selected, Alarm Messages are not printed. When the T-BERD 305 **PRI EVE** command is **OFF**, the **@ALARM ON** command is disabled.

SEE: T-BERD 305 PRI EVE

EXAMPLE:

```
> @ALARM OFF          : disable Alarm Message printouts
> @ALARM              : print the current ALARM command status
OFF
>
```

Select Auxiliary Loop Code

@LOO COD : Print Auxiliary Loop Code command status

@LOO COD (code name) : Select loop-codes

The command sets or prints the current Auxiliary Loop Code command status. The **(code names)** are as follows:

FAC1 : Facility 1 loop codes — Loop-Up code 1100, Loop-Down code 1110

FAC2 : Facility 2 loop codes — Loop-Up code 11000, Loop-Down code 11100

CSU : CSU loop codes — Loop-Up code 10000, Loop-Down code 100

PGM : Programmable loop codes — Loop-Up code 10000, Loop-Down code 100 (factory default)

The FAC1, FAC2, and CSU loop codes are fixed loop codes. The Programmable Loop Codes are defined through the Programmable Loop-Up Code (**@PGM LPUP**) and Loop-Down Code (**@PGM LPDN**) commands. The Loop-Up code is transmitted by issuing the **@LOO UP** command. The Loop-Down code is transmitted by issuing the **@LOO DOW** command.

SEE: **@PGM LPDN**, **@PGM LPUP**, **@LOO UP**, **@LOO DOW**, **@LP FRM**, Auxiliary LP CODE, LP FRM, PGM LPDN, and PGM LPUP functions, and **LOOP CODES** switches

EXAMPLE:

> **@LOO COD** : print current Auxiliary Loop Code status

CSU LOOP-UP 1100
LOOP-DOWN 1110

> **@PGM LPDN 10001000** : set Programmable Loop-Down Code to 10001000

> **@PGM LPUP 1001** : set Programmable Loop-Up Code to 1001

> **@LOO COD PGM** : select Programmable Loop Codes

> **@LOO UP** : send Programmable Loop-Up Code

Loop-up achieved. : loop code status message printed on successful loopback

> **@LOO DOW** : send Programmable Loop-Down Code

Loop-down achieved. : loop code status message printed on successful loop down

>

Print PRINTER/REMOTE CONTROL Baud Rate

@BAUD : Print current PRINTER/REMOTE CONTROL port Baud Rate setting

The command only prints the current T-BERD 203 PRINTER/REMOTE CONTROL port Baud Rate setting (300, 1200, 2400, or 4800 baud). The Baud Rate cannot be changed from remote control, only from the T-BERD 305 DIP switches or the T-BERD 203 Auxiliary BAUD function.

SEE: **@PARITY**, Auxiliary BAUD function, and T-BERD 305 **DIP** switches

EXAMPLE:

```
> @BAUD                    : print current baud rate
2400
>
```

Select DS0 Channel

@CHA SEL	: Print currently selected DS0 channel
@CHA SEL [1 - 24]	: Select DS0 channel to be tested and/or monitored

The command sets or prints the current DS0 channel being tested or monitored.

SEE: **DS0 CHANNEL SELECT** switch

EXAMPLE:

> **@CHA SEL**	: print current DS0 channel
10	
> **@CHA SEL 15**	: select channel 15 for testing
>	

Print CONTROLS Printout

@CONTROLS : Generate CONTROLS printout

The command generates a CONTROLS printout of the current T-BERD 203 switch and Auxiliary function settings. The **@PRI CON** command also generates the same CONTROLS printout.

SEE: **@PRI** and **PRINT CONTROLS** switch

EXAMPLE:

```
> @CONTROLS                    : print current settings
   .                           : current settings printed
   .
   .
>
```

Select DATA PORT Output

@DAT POR SEL : Print DATA PORT status
@DAT POR SEL [DS0/DATALINK] : Select DATA PORT output

The command sets or prints the current DATA PORT status. When **@DAT POR SEL DS0** is selected, the DATA PORT provides access to the selected channel at the DS0 level. When **@DAT POR SEL DATALINK** is selected, the DATA PORT provides access to the selected channel ESF, ESFz or SLC-96 data link.

SEE: Auxiliary DATAPORT function

EXAMPLE:

> **@DAT POR SEL** : print current DATA PORT status
DATALINK
> **@DAT POR SEL DS0** : select the DS0 output
>

Display Hold Control

@DIS HOL	: Print Display Hold status
@DIS HOL [ON/OFF]	: Enable or disable Display Hold

The command sets or prints the current Display Hold mode status. If **@DIS HOL ON** is selected, the T-BERD 203 displayed results are frozen at their current state. With **@DIS HOL OFF** selected, the displayed results are constantly updated to reflect the current values. Note that while **@DIS HOL** is **ON**, any results accessed from remote control using the **@RES1** and **@RES2** commands are the current values rather than the values being held in the display.

SEE: **DISPLAY HOLD** switch

EXAMPLE:

> **@DIS HOL**	: print the Display Hold mode status
OFF	
> **@DIS HOL ON**	: enable Display Hold mode, results are frozen.
>	

Front Panel Display Mode

@DISPLAY	: Print the Display Mode status
@DISPLAY [LOCAL/REMOTE]	: Set the front panel Display Mode

The command sets or prints the current Display Mode status. It permits the remote controller to determine whether or not the front panel **RESULTS** switches are active while the T-BERD 203 is under remote control. If the **@DISPLAY LOCAL** selection is made, the two **RESULTS** switches remain active while the T-BERD 203 is in remote control (allowing the user to scroll through all of the results). The **@DISPLAY REMOTE** selection disables the **RESULTS** switches (along with all others) allowing only the remote controller to manipulate the displayed results (from the **@RES 1** and **@RES 2** commands). **@DISPLAY LOCAL** is automatically set upon entering Remote Control mode.

EXAMPLE:

> **@DISPLAY**	: print the Display Mode status
REMOTE	
> **@DISPLAY LOCAL**	: enable front panel display control
>	

Insert Logic Errors

@ERR INS	: Print status of Logic Error insert
@ERR INS [OFF/10-3]	: Enable or disable constant logic error rate
@ERR INS SIN	: Insert single logic error

The command sets or prints the current Logic Error Insert Rate command status. Selecting **@ERR INS 10-3** generates one error in a thousand data bits (10^{-3}) transmitted. Selecting the **@ERR INS OFF** terminates this condition. The **@ERR INS SIN** command causes a single error to be inserted into the generated data. Note that a single error insertion terminates the 10^{-3} error insertion rate.

SEE: **ERROR INSERT** switch

EXAMPLE:

> @ERR INS OFF	: turn off the Error Insertion Rate
> @ERR INS	: print the Error Insertion Rate status
OFF	
> @ERR INS 10-3	: activate 10^{-3} error insertion rate
> @ERR INS SIN	: insert a single error
> @ERR INS	: print Error Insertion Rate status
OFF	
>	

On-Line Help Function

@HELP	: Display list of all HELP commands
@HELP!	: Display list of all commands
@HELP (command name)	: Display the parameter syntax for a command

The command provides access to the T-BERD 203 on-line HELP features. The **@HELP!** command shows the list of all remote control commands. Entering **@HELP (command name)** causes the T-BERD to print a list of all possible parameters associated with the specified command.

EXAMPLE:

> **@HELP!**	: print list of all commands
.	
.	
.	
> **@HELP DIS HOL**	: print list of parameters for **@DIS HOL** command

ON
OFF
>

Reset History LEDs

@HIS RES : Clear Alarm HISTORY LEDs

The command clears all of the Alarm HISTORY LEDs in the upper right corner of the T-BERD 203.

SEE: **@LEDS**, Alarm Status Panel, **@RESTART, RESTART** switch, and **HISTORY RESET** switch

EXAMPLE:

```
>@HIS RES                    : clear history LEDs
>
```

Print Front Panel LED Status

@LEDS : Print Front Panel LED status

The command causes the T-BERD 203 to print a chart of the front panel status LEDs (current and history) and their status at the time that the command is received. Note that **@DIS HOL ON** does not affect this print. The LEDs include:

SIGNAL LOSS
SIGNAL LOSS HISTORY
PATTERN LOSS
PATTERN LOSS HISTORY
FRAME LOSS
FRAME LOSS HISTORY
EXCESS ZEROS
EXCESS ZEROS HISTORY
YELLOW ALARM
YELLOW ALARM HISTORY
ALL ONES
ALL ONES HISTORY
ERROR EVENT
ERROR EVENT HISTORY
T1 PULSES
PATTERN SYNC
FRAME SYNC
B8ZS

SEE: **@HIS RES**, Alarm Status Panel, Received Signal Status Panel, **@RESTART**, **RESTART** switch, and **HISTORY RESET** switch

EXAMPLE:

```
>@LEDS                    : print chart of current LEDs status
  .
  .
  .
>
```

Generate Loop-Down Code

@LOO DOW	: Print status of Loop-Down Code command
@LOO DOW [ON/OFF]	: Enable or disable Loop-Down Code generation

The command sets or prints the current Loop-Down Code command status. When **@LOO DOW ON** is selected, the Loop-Down Code is generated. When **@LOO DOW OFF** is selected, the transmission of the Loop-Down Code (if active) is halted. The Loop-Down Code transmission continues until it is no longer detected by the T-BERD 203 receiver or until **@LOO DOW OFF** is issued. The Loop-Down Code transmitted depends on the Loop Code pattern selected from the Auxiliary Loop Code menu (**@LOO COD**).

SEE: **@LOO COD**, **@PGM LPDN**, **@LOO UP**, **@LP FRM,** Auxiliary LP CODE, LP FRM, and PGM LPDN functions, and **LOOP CODES** switches

EXAMPLE:

> **@LOO DOW**	: print status of Loop-Down Code
OFF	
> **@LOO DOW ON**	: generate Loop-Down Code
>	

Generate Loop-Up Code

@LOO UP	: Print status of Loop-Up Code command
@LOO UP [ON/OFF]	: Enable or disable Loop-Up Code generation

The command sets or prints the current Loop-Up Code command status. When **@LOO UP ON** is selected, the Loop-Up Code is generated. When **@LOO UP OFF** is selected, the transmission of the Loop-Up Code (if active) is halted. The Loop-Up Code transmission continues until it is detected by the T-BERD 203 receiver for 250 ms or until **@LOO UP OFF** is issued. The Loop-Up Code transmitted depends on the Loop Code pattern selected from the Auxiliary Loop Code menu (**@LOO COD**).

SEE: **@LOO COD**, **@PGM LPUP**, **@LOO DOW**, **@LP FRM**, Auxiliary LP CODE, LP FRM, and PGM LPUP functions, and **LOOP CODES** switches

EXAMPLE:

> **@LOO UP**	: print status of Loop-Up Code
OFF	
> **@LOO UP ON**	: generate Loop-Up Code
>	

Loop-Code Framing Control

@LP FRM	: Print status of Loop-Code Framing
@LP FRM [IMB/OVE]	: Select Loop-Code Framing

The command sets or prints the current Loop-Code Framing command status. When **LP FRM IMB** is selected, framing bits are imbedded or interleaved in the transmitted loop code bit pattern. When **LP FRM OVE** is selected, framing bits overwrite the transmitted loop code bit pattern. This applies to transmitting loop codes while in a Framed mode (T1 D4, T1 ESF, T1 ESFz, or T1 SLC).

SEE: **@LOO COD**, **@PGM LPDN**, **@PGM LPUP**, **@LOO UP**, **@LOO DOW**, Auxiliary LP CODE, LP FRM, PGM LPDN, and PGM LPUP functions, and LOOP CODES switches

EXAMPLE:

> **@LP FRM OVE**	: print status of Loop-Code Framing command
> **@LP FRM IMB**	: select imbedded framing
>	

Select Operating Mode Format

@MOD	: Print Operating Mode Format status
@MOD (mode)	: Select transmit and receive Operating Mode Format

The command sets or prints the current T1 Operating Mode Format. The operating **(mode)** can be one of the following:

T1	: T1 rate unframed
T1 D4	: T1 rate with D4 framing
T1 ESF	: T1 rate with ESF framing
T1 ESFz	: T1 rate with ESFz framing
T1 SLC	: T1 rate with SLC-96 framing

NOTE: The T1 ESFz mode is valid only when the ZBTSI option is installed.

EXAMPLE:

> **@MOD**	: print status of operating mode
T1 SLC	
> **@MOD T1 ESF**	: set operating mode to T1 rate with ESF framing
>	

Print PRINTER/REMOTE CONTROL Parity

@PARITY : Print current PRINTER/REMOTE CONTROL port parity setting

The command prints the current T-BERD 203 PRINTER/REMOTE CONTROL port parity setting (ODD, EVEN, or NONE). Parity cannot be changed from remote control. Parity is controlled through the T-BERD 203 Auxiliary PARITY function.

SEE: **@BAUD**, Auxiliary PARITY function, and T-BERD 305 **DIP** switches

EXAMPLE:

```
> @PARITY                    : print current parity setting
NONE
>
```

Generate Data Pattern

@PAT : Print data pattern status
@PAT (pattern) : Generate selected data pattern

The command sets or prints the current data pattern genera ted by the T-BERD 203. When the pattern is selected, it is immediately transmitted. The data **(pattern)** can be one of the following:

ALL ONE	: All Marks fixed pattern
3 IN 24	: 0100 0100 0000 0000 0000 0100 fixed pattern
QRS	: QRSS 2^{20}-1 pseudorandom bit pattern with zero suppression
2^20-1	: 2^{20}-1 pseudorandom bit pattern
2^23-1	: 2^{23}-1 pseudorandom bit pattern
PGM PAT	: User-defined fixed bit pattern

The Programmable Data Pattern **(@PAT PGM PAT)** is defined through the **@PGM PAT** command.

SEE: **@PGM PAT**, **PATTERN** switch, and Auxiliary PGM PAT function

EXAMPLE:

> **@PAT** : print data pattern status
QRS
> **@PAT 2^20-1** : select new pattern
>

Program Loop-Down Code

@PGM LPDN :Print Programmed Loop-Down Code
@PGM LPDN (bbbbb..b) :Set Programmed Loop-Down Code sequence

The command sets or prints the current programmed Loop-Down Code sequence. The Loop-Down Code sequence **(bbbbb..b)** is a 3- to 8-bit binary pattern (a sequence of ones and/or zeros) with the left-most bit transmitted first. The programmed Loop-Down Code is selected through the Auxiliary Loop Code function (**@LOO COD**). The loop code is transmitted by issuing the **@LOO DOW** command.

SEE: **@LOO COD**, **@PGM LPUP**, **@LOO DOW**, **@LP FRM**, Auxiliary LP CODE, LP FRM, and, PGM LPDN functions, and **LOOP CODES** switches

EXAMPLE:

```
>@PGM LPDN                    :print current programmable loop-down code
100
>@PGM LPDN 10001000           :set Programmable Loop-Down Code to
                               10001000
>
```

Programmable Loop-Up Code

@PGM LPUP	:Print Programmable Loop-Up Code
@PGM LPUP (bbbbb..b)	:Set Programmable Loop-Up Code sequence

The command sets or prints the current Programmable Loop-Up Code sequence. The Loop-Up Code sequence **(bbbbb..b)** is a 3- to 8-bit binary pattern (a sequence of ones and/or zeros) with the left-most bit transmitted first. The Programmable Loop-Up Code is selected through the Auxiliary Loop Code function (**@LOO COD**). The loop code is transmitted by issuing the **@LOO UP** command.

SEE: **@LOO COD**, **@PGM LPDN**, **@LOO UP**, **@LP FRM**, Auxiliary LP CODE, LP FRM, and PGM LPUP functions, and **LOOP CODES** switches

EXAMPLE:

>**@ PGM LPUP**	:print current Programmable Loop-Up Code
10000	
>**@ PGM LPUP 1000000**	:set Programmable Loop-Up Code to 1000000

>

Program Data Bit Pattern

@PGM PAT	: Print Programmable Data Pattern
@PGM PAT (bbbbb...b)	: Set Programmable Data Pattern bit sequence

The command sets or prints the current Programmable Data Pattern. The Data Pattern sequence **(bbbbb..b)** is a 3- to 24-bit binary pattern (a sequence of ones and/or zeros) with the left-most bit transmitted first. The pattern is generated when the **@PAT PGM PAT** command is issued.

SEE: **@PAT**, **PATTERN** switch, and Auxiliary PGM PAT function

EXAMPLE:

> **@PGM PAT**	: print current programmable pattern
10000000	
> **@PGM PAT 11010101110000**	: select bit sequence for programmable pattern
>	

Print CONTROLS/RESULTS Printout

@PRI [CON/RES] : Print CONTROLS or RESULTS printout

The command generates a T-BERD 203 CONTROLS or RESULTS printout. The **@PRI RES** and **@PRI CON** commands generate T-BERD 203 RESULTS printouts and CONTROLS printouts, respectively. The **@RESULTS** and **@CONTROLS** commands can also be used to generate their respective printouts.

SEE: **@CONTROLS**, **@RESULTS**, and **PRINT** switch

EXAMPLE:

```
> @PRI RES                : generate RESULTS printout
   .                      : RESULTS printout follows
   .
   .
> @PRI CON                : generate CONTROLS printout
   .                      : CONTROLS printout follows
   .
   .
>
```

Print Single T-BERD 203 Result Value

@PRINT (result number) : Print specified Result value

The command prints the selected T-BERD 203 Result value. The valid **(result numbers)** are as follows:

00 (BIT ERRORS)	: Bit errors
01 (ASYN ER SEC)	: Asynchronous errored seconds
04 (BIT ERR RT)	: Bit error rate
06 (%EFS)	: % Error-free seconds
07 (SYN ERR SEC)	: Synchronized errored seconds
08 (OUT SYN SEC)	: Out-of-sync seconds
09 (SLIPS)	: Pattern slips
10 (SEV ERR SEC)	: Severely errored seconds
16 (CSES)	: Consecutive severely errored seconds
25 (BPVs)	: Bipolar violations
26 (BPV SEC)	: BPV seconds
27 (BPV RATE)	: BPV error rate
28 (FRM ERR SEC)	: Frame errored seconds
29 (FRM SES)	: Frame severely errored seconds
30 (FRM ERRORS)	: Frame errors
31 (FRM ERR RT)	: Frame error rate
32 (CRC ERRORS)	: CRC errors
33 (CRC ERR SEC)	: CRC errored seconds
35 (FRM LOS SEC)	: Frame loss seconds
36 (CRC SES)	: CRC severely errored seconds
37 (CRC ERR RT)	: CRC error rate
40 (RX FREQ, Hz)	: Receive frequency in Hz
44 (SIG LOS SEC)	: Signal loss seconds
54 (ELAPSE TIME)	: Elapsed time
60 (A:/B: Signaling)	: A and B Signaling Status
64 (C:/D: Signaling)	: C and D Signaling Status

SEE: **@PRI**, **@RES 1/2**, and **@RESULTS**

EXAMPLE:

```
> @PRINT 09                    : print result number 09 (SLIPS).
23
>
```

Display Analysis Results by Display

@RES 1 (result number) : Display Result in the RESULTS I display
@RES 2 (result number) : Display Result in the RESULTS II display

The command displays the selected Result in the specified display (the RESULTS I display or the RESULTS II display). The valid **(result numbers)** are as follows:

00 (BIT ERRORS)	: Bit errors
01 (ASYN ER SEC)	: Asynchronous errored seconds
04 (BIT ERR RT)	: Bit error rate
06 (%EFS)	: % Error-free seconds
07 (SYN ERR SEC)	: Synchronized errored seconds
08 (OUT SYN SEC)	: Out-of-sync seconds
09 (SLIPS)	: Pattern slips
10 (SEV ERR SEC)	: Severely errored seconds
16 (CSES)	: Consecutive severely errored seconds
25 (BPVs)	: Bipolar violations
26 (BPV SEC)	: BPV seconds
27 (BPV RATE)	: BPV error rate
28 (FRM ERR SEC)	: Frame errored seconds
29 (FRM SES)	: Frame severely errored seconds
30 (FRM ERRORS)	: Frame errors
31 (FRM ERR RT)	: Frame error rate
32 (CRC ERRORS)	: CRC errors
33 (CRC ERR SEC)	: CRC errored seconds
35 (FRM LOS SEC)	: Frame loss seconds
36 (CRC SES)	: CRC severely errored seconds
37 (CRC ERR RT)	: CRC error rate
40 (RX FREQ, Hz)	: Receive frequency in Hz
44 (SIG LOS SEC)	: Signal loss seconds
54 (ELAPSE TIME)	: Elapsed time
60 (A:/B: Signaling)	: A and B Signaling Status
64 (C:/D: Signaling)	: C and D Signaling Status

Results 60 and 64 can only be displayed from the RESULTS I display.

Display Analysis Results by Display (Continued)

SEE: **@PRI**, **@RESULTS**, and **RESULTS** switches

EXAMPLE:

> **@RES 1 54**	: display Elapsed Time in the RESULTS I display
> **@RES 2 35**	: display Frame Loss Seconds in the RESULTS II display
>	

Restart Test

@RESTART

The command restarts the T-BERD 203 test. All results and Alarm LEDs are cleared with this command.

SEE: **RESTART** switch

EXAMPLE:

```
> @RESTART                    : restart test
>
```

Print RESULTS Printout

@RESULTS

The command generates a T-BERD 203 RESULTS printout. The **@PRI RES** command also generates the same RESULTS printout.

SEE: **@PRI** and **PRINT** switch

EXAMPLE:

```
> @RESULTS
   .                          : RESULTS printout is generated
   .
   .
>
```

Select Timing Mode

@TIM : Print current Timing mode
@TIM [INT/REC/LOO] : Select Timing mode

The command sets or prints the current Timing mode. The T-BERD Timing mode can be set to **INT**ernal, **REC**covered or **LOO**p. Note that both **REC** and **LOO** select recovered (loop) timing.

SEE: **TIMING** switch

EXAMPLE:

> **@TIM** : print current Timing mode
INT
> **@TIM REC** : select recovered Timing mode
>

T-BERD 305 DS3 Analyzer Software Upgrade

The T-BERD 305 DS3 Analyzer may require a software upgrade (revision I) before it can be used with the T-BERD 203 DS1/DS0 Analyzer. The following instructions describe how to install an EPROM replacement card in the T-BERD 305. The T-BERD 305 software upgrade kit should contain one EPROM card (with four EPROMs installed).

To upgrade the T-BERD 305, perform the following steps (see Figure B-1).

(1) Remove AC power from the T-BERD 305 and disconnect the AC line cord from the AC power connector (1) on the right side of the instrument rear panel.

CAUTION: Take appropriate action to guard against electrostatic discharge when handling EPROM card (e.g., wrist grounding strap).

(2) Using a small Phillips head screwdriver, remove and retain the two screws used to attach the top cover to the T-BERD 305.

(3) To remove the top cover, slide the cover back about 1/2 inch and lift up.

(4) To locate the EPROM card inside the T-BERD 305, face the front of the instrument. The EPROM card is located on the right side of the Processor Board (3) directly behind the front panel.

(5) Remove and retain the "finger-tight" screw (4) which holds the EPROM card in place.

(6) To remove the EPROM card (5), grasp the small tab and pull up. (NOTE THE EPROM CARD ORIENTATION TO THE FRONT AND BACK OF THE INSTRUMENT.)

(7) Remove the new EPROM card from its protective bag and install it in the T-BERD 305 as shown in Figure 10. (BE SURE TO INSTALL EPROM CARD WITH THE EPROMs FACING THE FRONT PANEL.) Use the "finger-tight" screw (4) to secure the installed replacement EPROM card.

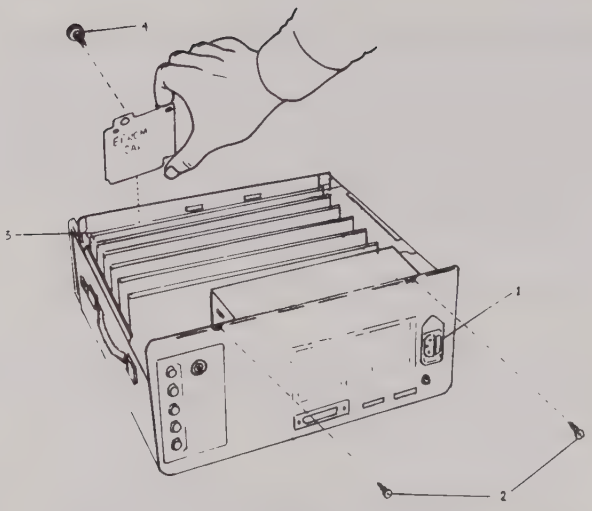

Figure B-1
T-BERD 305 DS3 Analyzer Software Upgrade Instructions

(8) Place the old EPROM card in the protective bag to be returned to TTC.

(9) Replace the top cover by placing it on top of the instrument 1/2 inch back from the front panel and sliding it gently forward until it snaps into place. Fasten it using the two Phillips head screws (2) removed in Step 2.

(10) Reconnect the AC power and verify proper operation of the T-BERD 305 using the instrument checkout procedure in Section 3 of the T-BERD 305 DS3 Analyzer Operating Manual, ML10835.

T-BERD 203 DS1/DS0 Analyzer Installation

To install the T-BERD 203 DS1/DS0 Analyzer on the front panel of a T-BERD 305 DS3 Analyzer, perform the following steps (see Figure C-1).

(1) Attach two sets of hinges to the bottom of the T-BERD 305 front panel as shown in Figure C-1a.

NOTE: The hinges supplied include: one male locking hinge, and one male non-locking hinge. Install the male slotted locking hinge post to the RIGHT side of the bottom of the T-BERD 305 (see Figure C-1b).

(2) Holding the T-BERD 203 at a 45° angle, insert the two hinge holders on the top of the T-BERD 203 onto the two hinge posts on the bottom of the T-BERD 305 (see Figure C-1b). Tilt the T-BERD 203 up until the right hinge lock snaps into place. Then slide the T-BERD 203 fully to the left until the unit is correctly aligned with the T-BERD 305 front panel.

(3) When the stand on the bottom of the T-BERD 305 is pulled down, the correct operating position of the T-BERD 203 is shown in Figure C-1c.

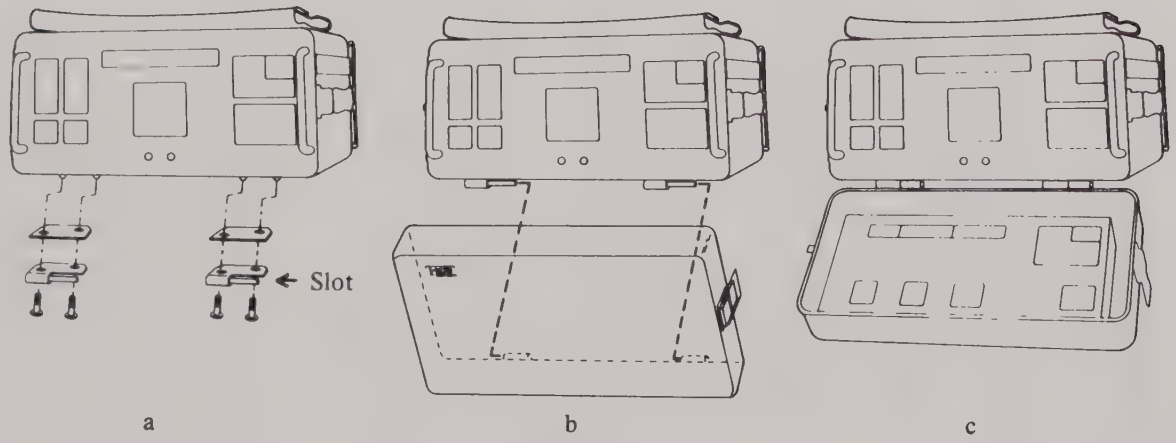

Figure C-1
T-BERD 203 DS1/DS0 Analyzer Installation

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